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(54) Title: ANALYTICAL DEVICE FOR RAPID IDENTIFICATION OF PATHOGENS

(57) Abstract: The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.



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Analytical device for Rapid Identification of Pathogens

The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.

Background

Isolation, identification and characterisation of bacteria and fungi from such diverse samples like food, environmental samples, clinical specimens, and veterinary samples is still a challenge for today's analytical laboratories. This is due to the fact that generally the identification of microorganisms includes three steps: (a) enrichment of microorganisms by culture, (b) subculture on solid media (preparation of a pure culture), and (c) performing a set of biochemical reactions specific for a particular pathogen. All these steps are dependent on the bacterial growth (slow), they are poorly automated (lot of manual work), and complex (require well educated personal).

Isolation, identification and characterisation of bacteria and fungi from clinical specimens is a main task of microbiological routine diagnostics. In fact, microorganisms are ubiquitous in certain areas of the human body. For this reason isolation and identification of pathogenic bacteria from clinical material and discrimination of specific pathogens from contaminations with indigenous or environmentally encountered microorganisms is a requirement for the correct diagnosis of infectious diseases. Additionally, accurate identification of antibiotic resistance and particular virulence factors provide important information enabling the clinician to choose effective antimicrobial therapy.

In the course of infection, many specimen types can be used for direct identification of the pathogens. These include, but are not limited to, liquor in the course of bacterial meningitis, sputum from patients with bacterial pneumonia, urine in the course of upper and lower urinary tract infections, punktate from sites of deep purulent infections (such as abscess, phlegmone, lung emphysema and septic arthritis), stool from patients with gastrointestinal tract infections, pus, swabs or wound fluid from purulent infections of the skin and wounds. Sometimes, bacteria

are represented in the specimen only in minor numbers, thus, indirect identification of pathogens after culture of specimens in liquid media is employed. Important examples are enrichment cultures of food samples during outbreaks of food borne infections and blood cultures for diagnosis of bloodstream infections.

- 5 The invasion of the bloodstream by microorganisms, especially bacteremia and fungemia, represents one of the most serious consequences of infections and is a high ranked cause of death (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-465 (1997)). Bacteremia is the means by which local infections spread
10 hematogenously to distant organs. This hematogenous dissemination of bacteria is part of the pathophysiology of, e.g., meningitis and endocarditis, Pott's disease and many other forms of osteomyelitis. In the hospital, indwelling catheters are a frequent cause of bacteremia and subsequent nosocomial infections, since they provide a means by which bacteria normally found on the skin can enter the
15 bloodstream. Other causes of bacteremia include dental procedures, urinary tract infections, intravenous drug use, and colorectal cancer.

- Systemic fungal infection is becoming more and more common in modern hospitals. The most common fungal infections are candidiasis and aspergillosis, but other systemic fungal infections such as Histoplasmosis, Blastomycosis,
20 Coccidioidomycosis and Cryptococcosis are also of increasing relevance. Systemic fungal infections in hospitals are commonly seen in immune compromised patients and - like bacteremia - in patients with indwelling catheters. Due to underlying serious illnesses and possible resistance of the pathogens to antifungal agents, patients with systemic fungal infections often have poor clinical outcomes.
25 Infections due to *Candida* species are the fourth most important cause of nosocomial bloodstream infection.

- Bacteremia is operationally defined as the presence of viable bacteria as evidenced by positive blood cultures. Fungemia is similarly defined as the presence of viable fungi as evidenced by positive blood cultures. When bacteremia or fungemia occurs
30 in the presence of systemic symptoms (such as fever or chills) the condition is designated as sepsis; and in the setting of more severe disturbances of

temperature, respiration, heart rate or white blood cell count, is characterised as systemic inflammatory response syndrome (SIRS).

Many septic episodes are nosocomial and often due to microorganisms with increased and multiple antimicrobial resistance. *Staphylococcus aureus*, *Escherichia coli*, Coagulase-negative staphylococci (CoNS), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus* spp., *Streptococcus* spp., *Candida albicans* and *Enterobacter cloacae* are the most frequent etiological agents of bacteremia and fungemia in Europe (Decousser, J. W. et al., J. Antimicrob. Chemother. 51:1214-22 (2003); Lyytikainen, O. et al., Clin. Infect. Dis. 35:314-9 (2002); Reacher, M.H. et al., BMJ 320:213-6 (2000); Rosenthal Kreuberger, E.J., Int. J. Antimicrob. Agents 24:196-8 (2004)) and the USA (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-82 (2001); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-65 (1997); Reisner, L.G. et al., J. Clin. Microbiol. 37:2024-6 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-13 (1999)).

Nosocomial bacteremia and especially sepsis require an immediate antibiotic therapy, even when the causative bacteria are still unknown. Thus, said therapy has to be performed as empirical initial therapy (Rello, J. et al., Intensive Care Med. 20:94-98 (1994)), which covers the complete spectrum of relevant pathogens. However, the increase of bacterial resistance lowers the chance of success for such empirical antibiotic treatments considerably (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). This primary therapy can only be replaced by a specific treatment after a thorough microbial diagnosis which usually takes 76-120 h (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-2082 (2001)). A fast track diagnosis which shortens this lag time would increase the chance of therapy success.

Rapid and reliable detection of bloodstream infections, including characterisation of the pathogen to the species level and determination of its antibiotic susceptibility pattern, is crucial for several reasons: (i) Appropriate antimicrobial agents can be selected, and thus, unnecessary treatment with ineffective antibiotics can be avoided; (ii) the prognosis of the patients can be improved; (iii) the acquisition of resistances in pathogens may be decelerated and (iv) expenditures on antimicrobials and overall hospital costs can be reduced (Barenfanger, J. et al., J.

Clin. Microbiol. 37:1415-8 (1999); Doern, G.V. et al., J. Clin. Microbiol. 32:1757-62 (1994); Trenholme, G.M. et al., J. Clin. Microbiol. 27:1342-5 (1989); Wheeler, A.P. and Bernard, G.R., N. Engl. J. Med. 340:207-14 (1999)). Therefore, there is a strong need for rapid tests for specific and sensitive identification of bacteria and pathogenic fungi directly from blood cultures.

The diagnosis of bacteremia commonly relies on blood cultures where the growth of microorganisms is continuously monitored by automated devices (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-1713 (1999)). Although such continuous-reading and computed systems decrease the time for detection of positive blood cultures, definitive pathogen identification from positive blood cultures still requires traditional Gram-staining, sub-culturing and susceptibility testing, delaying the identification of pathogens for one to three days (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003); Oliveira, K. et al., J. Clin. Microbiol. 40:247-251 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). The subculture procedure with subsequent species identification and determination of antibiotic resistance is time-consuming and elaborate. The biochemical and immunological assays like testing with coagulase, nuclease or latex agglutination are not always reliable. Antigenic and biochemical variations of bacteria grown in blood culture, inhibitory action of blood culture medium components as well as the presence of more than one microbial species may mislead data interpretation.

Staphylococci are the most important and frequent group of pathogens growing in blood culture, responsible for 30% to more than 50% of all bacteremia events (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Velasco, E. et al., Sao Paulo Med. J. 118:131-138 (2000)) with a mortality rate ranging from 13 to 50% (McClelland, R.S. et al., Arch. Intern. Med. 159:1244-1247 (1999); Rello, J. et al., Intensive Care Med. 20:94-98 (1994); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). The emergence of *S. aureus* strains with multiple resistance to antibiotics makes empirical therapy prone to fail (Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). *S. aureus* is generally regarded as a virulent

pathogen, whereas CoNS are either considered as a cause of catheter-associated nosocomial bacteremia or, more frequently, as blood culture contamination. Thus, a sub-genus identification of gram-positive cocci in clusters (CPCC) is of great clinical significance (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)).

- 5 Methods used up to date for direct identification of *S. aureus* growing in blood culture bottles include biochemical tests, like detection of thermostable nuclease or tube coagulase test, or commercial antibody-based kits connected with the disadvantages listed above.

Besides *S. aureus* and coagulase-negative staphylococci, *E. coli*, *Klebsiella* spp.,
10 *Enterobacter* spp., *Proteus* spp., *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*, beta hemolytic Streptococci and *Enterococcus* spp. belong to the most frequent reported pathogens causing bacteremia (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Reacher, M.H. et al., BMJ, 320:213-6 (2000); Lyytikainen, O. et al., Clin. Infect. Dis., 35:e14-9 (2002)) In order to reduce the
15 time needed for identification and susceptibility testing, the possibility of combining an automated blood culture system with an automated identification and susceptibility testing system by direct inoculation from positive blood cultures has been studied for gram-positive cocci as well as for gram-negative rods by several groups of investigators, but with varying success (Reimer, L.G. et al., Clin.
20 Microbiol. Rev., 10:444-65 (1997); Hansen, D.S. et al., Clin. Microbiol. Infect., 8:38-44 (2002); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)). Although the authors saw some potential of the combined system to allow the agar isolation step to be skipped, the system is hampered by the fact that (i) the blood culture sample
25 has to undergo a time-consuming separation procedure for the enrichment of bacterial cells, (ii) the identification rate varies depending on the employed identification system and (iii) the performance is not equally good for gram-negative and gram-positive pathogens (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and
30 Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)).

Considerable progress was made using nucleic acid-based methods for the identification and genotyping of bacteria or fungi in blood specimens. Assays employing ribosomal RNA-based oligonucleotide probes like fluorescence *in situ*

hybridisation (FISH) (Chapin, K. and Musgnug, M., J. Clin. Microbiol. 41:4324-7 (2003); Jansen, G.J. et al., J. Clin. Microbiol. 38:814-7 (2000); Kempf, V.A. et al., J. Clin. Microbiol. 38:830-8 (2000); Oliveira, K. et al., J. Clin. Microbiol. 41:889-91 (2003)) or microarrays (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-8 (2000);
5 Marlowe, E.M. et al., J. Clin. Microbiol. 41:5127-33 (2003); Sogaard, M. et al., J. Clin. Microbiol., 43:1947-9 (2005)) provide for rapid species identification in blood cultures. However, methods solely based on ribosomal RNA probes allow species identification only, and do not provide information on antibiotic susceptibility and other strain specific characteristics (e.g. virulence genes). For the molecular
10 detection of antibiotic resistances in staphylococci, several multiplex PCR-based assays were described (Martineau, F. et al., Antimicrob. Agents Chemother. 44:231-8 (2000); Shrestha, N.K. et al., Approved standard M2-4A, Villanova, PA (1990); Strommenger, B.C. et al. J. Clin. Microbiol. 41:4089-94; Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-31 (2001)). Several groups have successfully identified *S.*
15 *aureus* and more specifically methicillin-resistant *S. aureus* strains (MRSA) from blood cultures by using DNA probes (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Poulsen, A.B. et al., J. Antimicrob. Chemother. 51 :419-421 (2003)), peptide nucleic acid probes (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)), multiplex PCR (Mason, W. J. et al., J. Clin. Microbiol. 39:3332-3338
20 (2001)), gel-based PCR (Krishnan, P.U. et al., J. Clin Pathol. 55:745-748 (2002)), and real-time PCR (Shrestha N.K. et al., J. Clin. Microbiol. 40:2659-2661 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)).

However, the use of such molecular assays suffers from two main restrictions: First, they rely on a pre-identification of the pathogen since their discriminatory
25 capacity is technically limited, for instance by the number of fluorochromes available for labelling the probes or, in the case of multiplex PCR, by the capacity of resolution in gel electrophoresis. These molecular assays are thus usually not scalable and unfit for high throughput analysis.

The last years have witnessed the emergence of many DNA microchip projects
30 arraying genes of microorganisms (Ye, R.W. et al., J. Microbiol. Methods 47:257-272 (2001)). They can detect tens of thousands of DNA sequences in a single hybridisation step (DeRisi, J.L. et al., Science 278:680-686 (1997); Duggan, D.J. et al., Nat. Genet. 21:10-14 (1999); Lashkari, D.A. et al., Proc. Natl. Acad. Sci. USA

94:13057-13062 (1997)). Originally developed for gene expression profiling, DNA sequence analysis and genotyping, microarrays were recently also used to identify viral (Wang, R.F. et al., FEMS Microbiol. Lett. 213:175-182 (2002)) and bacterial (Bekal, S. et al., J. Clin. Microbiol. 41:2113-2125 (2003)) pathogens in environmental and clinical samples.

Most of the published reports employed oligonucleotide microarrays containing a reduced number of spotted probes and representing a single bacterial species only (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003); Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)). Such arrays were used to identify pathogenic strains belonging to a pre-identified species (Chizhikov, V. et al., Appl. Environ. Microbiol. 67:3258-3263 (2001)), to distinguish between species of the same genus (Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)) or to detect genes encoding resistance to a certain antibiotic (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003)).

Further microarrays for detection of bacteria and fungi are known in the art (Nakamura, M. et al., Abstracts of the general meeting of the American society for microbiology, abstract No C219 (2003); Wang, R.-F. et al., Molecular and Cellular Probes 223-224 (2004); Lehner, A. et al., FEMS Microbiol. Lett. 133-142 (2005); EP 1310569; WO 92/07096; US-B1-6,747,137). However, all these microarrays have in common the use of short oligonucleotides with a maximum length of 40 nt ("short oligonucleotides"). They are short-oligonucleotide microarrays. Although such short-oligonucleotide microarrays could be rapidly designed and built up they carry some intrinsic disadvantages: like all methods based on single and often short DNA sequences they show reduced reliability and sensitivity (Stears, R.L. et al., Nat. Med. 9:140-145 (2003)). To palliate the high probability of non-specific hybridisation due to the short size (20-40 bp) of the oligonucleotides it is necessary to design many partially overlapping oligonucleotides in order to confirm the presence of a gene. This consequent increase in complexity makes it extremely difficult to set up the optimal hybridisation conditions necessary for producing trustful results. Moreover, surface-bound short oligonucleotides have poor hybridisation properties and are highly sensitive to single nucleotide polymorphisms (Hughes, T.R. et al., Nat. Biotechnol. 19:342-347 (2001)). For these reasons,

oligonucleotide microarrays using oligonucleotides with a maximum length of 40 nt are unsuitable for routine diagnostics.

Up to now, diagnosis of bacteremia by microarrays is limited to species identification by oligonucleotides for 23S and 18S RNA sequences, which is still strictly experimental (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-788 (2000)) and carries along the methodological weakness associated to the use of short oligonucleotides as hybridisation probes.

A DNA microarray employing capture probes of more than 40 nt length amplified by PCR was described by Fitzgerald et al. (Fitzgerald, J.R. et al., Proc. Natl. Acad. Sci. USA 98(15):8821-8826 (2001)). To investigate molecular population genetics of *Staphylococcus aureus* on a genome scale, a microarray comprising 2817 complete ORFs of *S. aureus* strain COL was constructed, representing >90% of the *S. aureus* genome. The microarray was able to discriminate 36 *S. aureus* strains. However, since it was not designed for the identification of different bacterial species, it was not tested for possible cross reactions with other bacteria besides *S. aureus*. Due to the conservative nature of many house-keeping proteins and genes, respectively, cross reactions of the microarray with CoNS strains and other bacterial species will occur. Unspecific cross reactions combined with the high number of probes (2817) result in a high complexity of the microarray data, not applicable to routine diagnostics. Furthermore, PCR amplification of long ORFs is a difficult procedure, in particular for bacteria with DNA of high GC-content.

The aim of present invention is to provide a gene-segment based analytical device, especially a microarray, for species specific identification and characterisation of different microorganisms, especially different bacteria and pathogenic fungi, present in a sample or clinical specimen which does not possess the drawbacks of the short-oligonucleotide microarray as outlined above. Said device/microarray must allow the specific identification of the target species and should furthermore allow the differentiation (i.e. distinguish) between different target microorganisms present in the sample or clinical specimen. It must furthermore provide a high reliability and sensitivity of detection.

Summary of the Invention

The present invention provides an analytical device, which is preferably a DNA microarray, for the identification and characterisation of microorganisms in

biological samples, especially of microorganisms connected with bacteremia, fungemia and sepsis. Species specific gene probes in this device/microarray allow the identification of different microbial species, whilst antibiotic resistance and virulence gene probes allow for the genotypic discrimination within a species. The
5 device/microarray can be designed to allow species identification, virulence determination and resistance determination independently from each other or simultaneously, and furthermore said determinations can be performed for one or more different microbial species and strains with one device/microarray. Furthermore, different microbial species and strains are discriminated, even in a
10 polymicrobial sample (specimen with more than one pathogen).

The device/DNA microarray according to present invention thus demonstrates the feasibility of simultaneously identifying and characterising different microbial species in a sample or clinical specimen, especially in blood samples, without prior PCR amplification of target DNA or pre-identification of the pathogen. This can
15 reduce sample processing time to a single day and less.

The invention furthermore provides a method for rapid identification and characterisation of microorganisms, especially of bacteria, yeasts and filamentous fungi, using the device/microarray of the invention. The method is quick, can be automated, leads to reproducible results and allows an early choice of specific
20 antibiotics for treatment of bacteremia, fungemia or sepsis.

In particular, the present invention provides

(1) an analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences
25 or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt);

(2) the use of the analytical device as defined in (1) above for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen,
30 preferably in a clinical specimen, more preferably for the diagnosis of a clinical condition, most preferably for the diagnosis of bacteremia, fungemia or sepsis;

(3) an *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

- (a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule, preferably a fluorochrome;
- (b) applying the DNA thus obtained to the analytical device as defined in (1) above and hybridising the DNA with the gene probes of the device; and
- 5 (c) detecting DNA bound to the device by determination of the amount of the reporter molecules bound to the device; and
- (4) a kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of embodiment (1).

Brief description of the Figures

10 Fig. 1: DNA microarray analyses of 58 clinical isolates, reference strains and blood cultures.

Each column shows the results of an individual hybridisation with target DNA prepared from: *S. aureus* ATCC 29213 (1), MW2 (2), clinical isolates (3-7), positive blood cultures (8-11); *P. aeruginosa* ATCC 27853 (12), clinical isolates (13-17),
 15 positive blood culture (18); *E. coli* ATCC 25922 (19), clinical isolates (20-25), positive blood cultures (26-27); *S. epidermidis* clinical isolates (28-32), positive blood cultures (33-35); clinical isolates of *S. auricularis* (36), *S. capitis* (37), *S. haemolyticus* (38), *S. hominis* (39), and *S. warneri* (40). Other Gram-negative species included a *Proteus mirabilis* positive blood culture (41), clinical isolates of
 20 *Proteus mirabilis* (42-43), *Serratia marcescens* (44-45), *Klebsiella pneumonia* (46-48), *Stenotrophomonas maltophilia* (49), *Acinetobacter baumannii* (50), *Enterobacter cloacae* (51) and *Enterobacter aerogenes* (52); other Gram-positive species included clinical isolates of *Micrococcus* spp. (53), *Enterococcus* spp. (54), *Enterococcus faecalis* (55) and *Streptococcus pneumoniae* (56) and two positive
 25 blood cultures of *S. pneumoniae* (57-58).

(A) Hybridisation of DNA prepared from bacterial isolates, reference strains and blood cultures with *E. coli* gene probes;

(B) hybridisation with *P. aeruginosa* gene probes;

(C) hybridisation with *S. aureus* gene probes.

30 Grey boxes represent gene probes which hybridised with the respective target DNA, white boxes represent gene probes which showed no hybridisation with the respective target DNA.

Fig. 2: Validation of the *S. aureus* microarray of example 1.11. 2 µg genomic DNA from *S. aureus* strain T94 were labelled either with Cy3 or Cy5, combined and hybridised as described in Example 1.11. Cy3: green signal; Cy5: red signal; double-hybridisation: yellow signal.

- 5 A) Overlay of microarray scanned using Cy3 and Cy5 filter sets;
 B) Scatterplot of normalized fluorescence intensities of individual gene probes after microarray hybridisation. The signal intensities from both channels correlate highly with each other ($r^2 = 0.97$).

Fig. 3: Specific identification of *S. aureus* from distantly related bacteria using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of pure *E. coli* (A) or *P. aeruginosa* (B) genomic DNA. Obtained hybridisation patterns are represented as bar codes, where the 140 spotted gene segments appear subsequently and are clustered in categories (NC: negative control; PC: positive control; Antibiotic Resistance Determinants; Virulence Factors and Metabolic Functions (see Tab. 6)). Positive hybridisation is indicated by a bar while negative spots are represented by an empty area. Both assays show clear *S. aureus* discrimination with practically no cross hybridisation between DNA from said gram negative bacteria and *S. aureus* selected genes, while the positive control (16S RNA sequence) reveals the good quality of hybridisation.

20 Fig. 4: Specific identification of *S. aureus* from coagulase negative staphylococci using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of *S. epidermidis* (A) or *S. saprophyticus* (B) genomic DNA. Obtained hybridisation patterns are illustrated by scanned fluorescent picture data (A: *S. aureus*: green signal; *S. epidermidis*: red signal; B: *S. aureus*: red signal; *S. saprophyticus*: green signal) and transformed in bar codes (see legend of Fig. 3).
 25 All specific *S. aureus* virulence factor genes hybridised exclusively with *S. aureus* DNA. Yellow spots showing cross-hybridisation correspond to some shared antibiotic resistance determinants and genes associated to metabolic functions.

Fig. 5: Specificity of the *S. aureus* microarray of example 1.11.

- 30 A) Scan of microarray hybridised with 2 µg each of genomic DNA from *S. aureus* strain T103 (Cy3, represented in green) or T100 (Cy5, represented in red), showing remarkable genotypic differences between strains.

B) PCR amplification of the genes from genomic DNA of *S. aureus* (strains T100 and T103) validating results of the microarray hybridisation shown in (A).

Fig. 6: Identification and characterisation of *S. aureus* from positive blood culture using the microarray of example 1.11.

- 5 2 µg of DNA prepared from blood culture positive for *S. aureus* (strain T95) was co-hybridised with 2 µg of DNA prepared from sterile blood culture or with 2 µg of pure *S. aureus* genomic DNA for 4 hours. Positive and negative spots are transformed in a bar code scheme (see legend of Fig. 3).

Sterile blood culture DNA did not cross-hybridise with spotted *S. aureus* genes (A).

- 10 Blood culture positive for *S. aureus* produced a fluorescent hybridisation pattern almost identical to the pattern obtained with pure *S. aureus* genomic DNA (B).

Fig. 7: Hybridization profiles obtained in Example 2 after microarray hybridization with DNA obtained from six bacterial target strains: (A) *S. aureus* ATCC 29213, (B) *S. epidermidis* BC 1920, (C) *S. pyogenes* DSM 11723, (D) *S. pneumoniae* ATCC 15 49619, (E) *E. faecalis* UW 700700/95, (F) *E. faecium* VRE9182 and two non-target strains: (G) *E. casseliflavus* UW703/95 and (H) *S. angiosus* DSM 20563.. Each bar represents the fluorescent signal of one capture probe. Fluorescent signals of the 930 probes represent the median intensity of four spots from which the local background was subtracted. Probe IDs are given in Table 8.

- 20 Fig. 8: Specificity of the microarray for *Candida albicans* in Example 2. (A) Hybridization profile obtained for *C. albicans* ATCC 10231. (B) Specificity of two *C. albicans* capture probes. Hybridization signals were determined for the two probes after hybridization with DNA obtained from 44 different microbial strains (see Table 9 for strain identification).

- 25 Fig. 9: Specificity of selected capture probes for (A) *Klebsiella oxytoca*, (B) *K. pneumoniae*, (C) *Proteus vulgaris* and (D) *P. mirabilis* does allow species discrimination. Fluorescence intensities refer to hybridization signals obtained for the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

- 30 Fig. 10: Specificity of selected capture probes for the coagulase-negative staphylococci (A) *S. epidermidis*, (B) *S. haemolyticus*, (C) *S. warneri* and (D) *S. saprophyticus*. Fluorescence intensities refer to hybridization signals obtained for

the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

Definitions

- 5 In the framework of the present invention the following terms and definitions are used.

An "analytical device" in the context of present invention is any solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes microtiter
10 plates coated with one or several DNA gene probes per well, glass surfaces (like, e.g., microscopic slides) with DNA spots, filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads may be used in a multi-chamber system, preferably in a microfluidic multi-chamber system, wherein
15 each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also
20 attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Vice versa, beads made of a magnetic material could be attached to an iron surface.

The analytical device of present application is preferably a DNA microarray, a
25 (magnetic) bead or set of beads coated with DNA probes or a microtiter plate coated with DNA probes. More preferred it is a (magnetic) bead or set of beads coated with DNA probes or a DNA microarray. In the most preferred aspect of present invention it is a DNA microarray.

A "DNA microarray" consists of a collection of nucleic acid sequences, preferably
30 DNA sequences, immobilized onto a solid support, such as glass, plastic or silicon chips, in a latticed pattern (forming an "array"). Each unique sequence of said sequences forms a tiny feature on the microarray called a "spot" or "capture probe". The size of these spots varies from one system to another, but is usually

less than two hundred micrometers in diameter, thus up to tens of thousands of spots can be arrayed in a total area of a few square centimeters. DNA microarrays provide a means to detect and quantify large numbers of discrete nucleic sequences in parallel. In a microarray hybridisation the nucleic acids in the sample that is being analysed (called "target") are expected to form duplexes specifically with the corresponding capture probes. Occurrence or absence of duplex formation indicate the presence or absence of said target. For routine microarray analysis, said target is commonly converted to a labelled population of nucleic acids, using reporter molecules. Hybridisation of said labelled target DNA molecules from the tested samples with complementary DNA sequences affixed in specific spots on the array can thus be detected by examination for the presence of said label on the array using a microarray scanner (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays", Spektrum Akademischer Verlag, Heidelberg (2004)).

In the following, the invention is exemplified for a DNA microarray (synonym: "array"). The invention can, however, also be performed using any other of the analytical devices as listed above.

"Gene probe" or "gene probe derived from..." refers to a DNA sequence present on the microarray of present invention and used as a capture probe. It is a DNA segment (see below) which is complementary to a target DNA sequence, preferably to a microbial, more preferably to a bacterial or fungal gene or gene segment. Said gene probe is prepared by any known method of DNA synthesis, and preferably prepared by cloning the respective PCR-amplified gene or gene segment into a plasmid/vector. The recombinant gene or gene segment is then amplified by PCR, isolated from the amplification mix, purified (preferably by ethanol-purification) and finally spotted onto the array.

An "isolate" is a microbial, especially a fungal or bacterial strain isolated from a given specimen, wherein the isolation includes at least one *in vitro* propagation.

A "clinical isolate" is an isolate from a clinical specimen.

"Coagulase-negative staphylococci" ("CoNS") are bacteria of the genus *Staphylococcus* which are negative for a bacterial coagulase (do not induce clotting of a serum). These are all *Staphylococci* with the exception of *S. aureus*. Preferred CoNS in the context of present invention are *Staphylococcus epidermidis*,

Staphylococcus haemolyticus, *Staphylococcus lugdunensis* and *Staphylococcus warneri*, of which *Staphylococcus epidermidis* is especially preferred.

An "isolated DNA" is a DNA separated or purified from the organism it is naturally associated with or from the clinical specimen in which it occurs. This comprises
5 biochemically or biophysically purified native DNA, recombinant DNA, chemically synthesized DNA and DNA analogues (e.g. peptide nucleic acids).

"Native" is synonymous to "naturally (occurring)".

A "DNA segment" or "gene segment" is an isolated DNA which contains or consists of a part of the native full-length sequence of a gene which is still able to hybridize
10 to the native sequence under stringent hybridisation conditions. Although the present invention is in the following exclusively described as relating to "DNA" sequences, it is not to be construed as being limited thereto. Rather, if the term "DNA" is used in connection with the gene probes or target sequences of present invention, it includes other polynucleotides (like RNA or RNA/DNA hybrids), and
15 DNA analogues such as PNA, phosphonate backbone DNA, artificial pentose or hexose backbone DNA which is able to hybridize with native DNA etc.. Furthermore, modified bases like deoxy bases, inosine or aminoallylcytosine may be used on all DNA, RNA and PNA backbones. However, DNA itself is the preferred polynucleotide for performance of the invention.

20 The DNA sequences used as gene probes in present invention are either identical, substantially identical or homologous to the complementary native target sequences (i.e. they are "derived from" said target sequences). In the context of present invention, when a specific DNA sequence is denominated, this encompasses not only said specific sequence, but also the sequences substantially identical or
25 homologous thereto, i.e. its substitution mutants. "Substantially identical" means that the DNA contains mutations of up to 10% of the total number of nt in comparison with the native DNA sequence and/or has a nucleotide identity of > 90% to the corresponding native DNA segment. Said mutations are preferably single nucleotide polymorphisms or point mutations and include the mutation of not
30 only a single but also a few (up to 10 nt, preferably up to 5 nt) consecutive nt. "Homologous" or "homologue" refers to a DNA sequence which has a sequence identity of more than 70% of the corresponding native DNA sequence and encompasses the substantially identical DNA sequences. Preferably, the sequences

used as gene probes are at least substantially identical to the corresponding native DNA sequence.

Preferred gene probes of the present invention are the DNA sequences listed in the sequence protocol, their complementary sequences or their corresponding native
5 DNA segment.

The DNA sequences used as gene probes in present invention may also be deletion or addition mutants of the corresponding native DNA segments. In case of deletion mutants, the minimum length of the DNA sequences suitable as probes in present invention is 100 nt. Preferably, the deletions take place at the 5'- and/or 3'-
10 terminus of the native DNA segment. In case of addition mutants, the added nucleotides may sum up to a total of 90% of the nucleotide number of the native DNA segment, if added at the 5'- or 3'-terminus of the DNA sequence. Alternatively, the additions and deletions may be of one isolated nucleotide or of 2 or more consecutive nucleotides at one or more internal site(s) of the native DNA
15 segment. Preferably, 0-30% nucleotides of the corresponding native DNA segment are added or deleted. It is most preferred that the addition or deletion mutants used as gene probes in present invention comprise one or more segment(s) of at least 100 consecutive nt each, which are derived from one gene, and/or sequences homologous (70% homology) or complementary thereto. These segments may be
20 embedded in or fused to other DNA sequences, which will not hybridize under stringent conditions with either human or bacterial DNA or the DNA of the target microorganism. Said other DNA sequences preferably have a maximum length which adds up with the length of the enclosed segment(s) to not more than the upper limit for the length of gene probes suitable for present invention.

25 A "positive blood culture" is an *in vitro* culture started from whole blood or blood components wherein the growth of microorganisms has been detected. Said growth is indicated by a positive growth index. The detection is preferably done by monitoring CO₂ production in the blood culture.

"Direct identification" of microorganisms refers to an identification method which
30 comprises isolation of DNA from a sample or clinical specimen, but does not require an amplification of the genetic material of the microorganisms after said isolation in order to identify the microorganisms using the method of present invention. The isolated genetic material is labelled and applied to the DNA microarray of present

invention without prior amplification, i.e. directly after isolation or after a short workup step.

„Species-specific“ probe(s) means that a species can be identified specifically and unambiguously using said probe or set of probes.

- 5 “Differentiation” means the discrimination among distinct and different species, genera or groups of pathogens.

A “detection method” in the context of the present invention is a method for determination of hybridisation of DNA molecules contained in a sample to the probes on the solid support of the microarray of present invention. This method
10 may be any textbook method for detection of DNA hybridisation on microarrays, e.g. direct detection or labelling of target DNA with a reporter molecule and consecutive visualisation of the reporter molecule. Preferred detection methods are said labelling method and the direct detection by electrical biosensors or mass spectrometry (Liu, R. H. et al., Anal. Chem. 76(7):1824-31 (2004); Stomakhin, A.
15 A. et al., Nucleic Acids Res. 28(5):1193-8 (2000)).

A “reporter molecule” in the context of the method of the present invention is a chemical or physical marker which allows differentiation of labelled from unlabelled DNA by physical, chemical or immunological methods. The labelling method includes, but is not limited to radioactive labelling (e.g. with ^{33}P , ^{32}P),
20 fluorescent/luminescent/chromophor labelling and hapten labelling (i.e. psoralen or DIG). It is followed by an appropriate detection step necessary to determine the presence and/or quantity of the reporter molecule, namely scintillation counting (e.g. phosphoimaging); photoptic measurement (e.g. fluorescence measurement, luminescence measurement) and antibody-based detection (including colorimetric,
25 luminescence or fluorescence detection), respectively. Preferably, the reporter molecule is a fluorochrome/fluorophor (both terms are used as synonyms in the context of present invention) which includes but is not limited to cyanines, fluoresceins and rhodamines. More preferably, it is of the cyanine group of fluorophores. Most preferably, it is selected from the group consisting of the
30 fluorophores Cy3, Cy5 or Alexa Fluor 647 and Alexa Fluor 546. The ratio of base to dye molecules (BDR) in DNA labelled with such reporter molecules is preferably less or equal to 60.

A "target species" is a species for which species-specific capture probes are present in the microarray, allowing species identification by positive hybridisation. "Non-target species" are all other species.

Detailed description of the invention

5 The present invention provides an analytical device, preferably a DNA microarray, and its use for rapid identification and characterisation of microorganisms in a sample or clinical specimen (embodiments (1) to (3)). The invention is exemplified in the following by the most preferred embodiment of the analytical device (1), namely a DNA microarray. The invention can, however, also be performed using
10 any other of the analytical devices as listed above. Thus, unless otherwise stated, in the following the term "DNA microarray of embodiment (1)" is to be understood as "analytical device of embodiment (1)".

The DNA microarray of embodiment (1) of the invention comprises gene specific DNA sequences as capture probes, which allow the identification of microbial
15 species ("target species"), especially of bacterial and fungal species, and/or their further characterisation with regard to antibiotic resistance and virulence. Preferably, it allows the identification and characterisation of the target species. It is specific, applicable to the analysis of DNA isolated from blood cultures and suitable to detect resistance genes.

20 The DNA microarray of embodiment (1) comprises at least 1 species specific probe per target species. In a preferred aspect of the invention, it additionally comprises one or more virulence and/or resistance gene probe(s).

A further preferred aspect of embodiment (1) is that the DNA microarray comprises species specific probes for more than one or multiple microbial species,
25 i.e. for a plurality of species. The DNA microarray of this preferred aspect of embodiment (1) allows the simultaneous detection of a plurality of microbial species in a sample without previous isolation and/or amplification of single species. It furthermore allows a one-step determination of whether certain microorganisms are present in a sample or not, even if the sample comprises a plurality of different
30 microbial strains.

One important feature of the microarray of the present invention is that the panel of probes can be continually extended to include sequences for additional species,

variant isolates or antibiotic resistance determinants as they are characterised and available. The accuracy, range and discriminatory power of the gene-segment based microarray can be refined by adding or removing gene probes to the panel without significantly increasing complexity or costs. In a pilot study, three
5 important species causing bacteremia were selected to provide a proof of principle (examples 1.1-1.10). The range of organisms that can be identified can be easily expanded by increasing the number of gene probes on the array. For example, addition of a few probes specific for *S. epidermidis* and other CoNS will allow for the species identification of coagulase-negative staphylococci. Furthermore, due to a
10 specific hybridisation pattern for each species it will also allow the identification of mixed blood cultures with more than one pathogen.

A second important feature of this microarray format is the length of the DNA sequences used as gene probes. They are at least 100 nt, preferably 100-3000 nt long. In an especially preferred aspect of embodiment (1) the length of the gene
15 probes is from 100 to 1000 nt, most preferably from 200 to 800 nt. Thus, one probe per gene is usually sufficient to produce strong signals and high specificity (Stears, R.L. et al., Nat. Med., 9:140-5 (2003)). For long probes like these, minor point mutations are likely to only slightly reduce duplex formation, which does not lead to the loss of hybridisation signals. In contrast, short oligonucleotide
20 microarrays sometimes lack specificity and require multiple short oligonucleotides per one gene.

The microorganisms or microbial DNA to be detected using the microarray of present invention are preferably bacteria (such as *Staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *P. aeruginosa*, *Klebsiella* spp., *Proteus* spp., *Enterobacter* spp.,
25 *Acinetobacter* spp. and *Stenotrophomonas* spp.) or fungi (such as yeasts and filamentous fungi, in particular *Candida* spp., *Aspergillus* spp., *Cryptococcus* spp., *Malassezia* spp., *Trichosporin* spp.), respectively bacterial or fungal DNA. The microarray is especially suitable for direct identification and characterisation of bacteria and *C. albicans*.

30 In a preferred aspect of embodiment (1) the analytical device is suitable for species specific identification of one microbial strain or (preferably) a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi. It furthermore allows differentiation of the target species from each other

and from non-target-species contained in one sample comprising a plurality of microbial strains.

In one preferred aspect of embodiments (1), (2) and (3), the DNA microarray is feasible to identify and characterize any of the microorganisms, including the fungi and bacteria as defined above, known as etiological agents of fungemia, bacteremia or sepsis. In another preferred aspect of (1), it is feasible to characterize the bacteria known as etiological agents of bacteremia or sepsis. More preferably, it is feasible to identify and characterize at least 90 % of said microorganisms or bacteria. Equally more preferably it is feasible to identify and characterize microorganisms selected from the group consisting of *S. aureus*, *Coagulase-negative staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *Klebsiella* spp., *Proteus* spp, *P. aeruginosa*, *Acinetobacter* spp. and *Candida albicans*, most preferably microorganisms selected from the group consisting of *S. aureus*, CoNS (including *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*, *Staphylococcus hominis*), *C. albicans*, *Enterococcus faecalis*, *Enterococcus faecium*, *E. coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*, *P. aeruginosa*, *Acinetobacter baumannii*, *Streptococcus agalactiae*, *Streptococcus bovis*, *Streptococcus mutans*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*.

In a first most preferred aspect of embodiment (1), the DNA microarray is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococci*, *E. coli* and *Candida* sp., preferably for species specific identification of *Staphylococci*, especially of *S. aureus*. More preferably, it is suitable for species specific identification of *Staphylococci* and at least one of *E. coli* and *Candida albicans*.

In a second most preferred aspect of embodiment (1), the DNA microarray is suitable to identify and characterize at least *S. aureus*, *Coagulase-negative staphylococci*, *E. coli*, *Enterococcus faecalis* and *faecium* and *Candida albicans*.

In addition to above aspects, the DNA microarray is in a preferred embodiment of present invention suitable for additional species specific identification or differentiation of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus*

pneumoniae, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and/or *Proteus vulgaris*.

The practicability and specificity of the DNA microarray for the identification and characterisation of *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* was evaluated with clinical isolates and positive blood cultures (Examples 1.1-1.10). Especially preferred is a microarray which allows identification and characterisation of *S. aureus*. The latter microarray allows the detection of every *S. aureus* isolate, unambiguously identifies most of important virulence genes such as *tsst-1*, *sea*, *seb*, *eta* and antibiotic resistance genes such as *mecA*, *aacA-aphD*, *blaZ*, *ermA* and specifically distinguishes *S. aureus* from unrelated gram negative bacteria, e.g. *Escherichia coli* or *Pseudomonas aeruginosa*, as well as from closely related CoNS (Example 1.11, Fig. 2-6).

In another preferred aspect of the invention, the microarray of (1) is suitable for diagnosis of fungemia, bacteremia or sepsis; especially for diagnosis of bacteremia, candidemia, and bacterial or *Candida* sepsis.

The present invention provides a novel approach for detection of microorganisms, especially of bacteria and fungi, by microarrays: using gene-segments it allows species identification by probing a large and diverse set of species-specific genes. Such an approach is reliable since it makes possible to identify a pathogen even when some genes have been deleted from its genome. Furthermore, the selected DNA probes are at least 100 nt, preferably 200 to 800 nt long and are therefore not sensitive to single nucleotide polymorphisms or CG-content variations in the targets. Therefore, a gene segment array according to present invention is useful for indicating the presence of a gene even though the sequence may be slightly altered e.g. by point mutations (Southern, E. et al., Nat. Genet. 21:5-9 (1999)). Additionally, it permits species virulence and antibiotics resistance profiling all together in a single-step test. Thus, present invention provides for a significant improvement compared to the classical approach focused on the detection of a short evolutionary conserved sequence like 16S RNA.

The number and perfect composition of gene-segments necessary for a correct species identification, virulence determination and resistance profiling must be determined by empiric specificity tests. Thus, in a preferred aspect of the invention, the DNA microarray of embodiment (1) comprises the minimal number of species

- specific gene probes which is sufficient for species identification, the minimal number of virulence gene probes which is sufficient for virulence determination, and/or the minimal number of resistance gene probes which is sufficient for determination of resistance of a specific microorganism. Preferably, the minimal number of gene probes in this aspect of the invention is: for correct species identification at least 1 species specific gene probes per target species, more preferably at least 2 different species specific gene probes per target species, even more preferably at least 10, most preferably at least 20; for virulence determination at least 1 gene probe per target species, more preferably at least 5 different gene probes, even more preferably at least 20 different gene probes, most preferably gene probes for all known virulence factors of each target species; for determination of resistance at least 1 gene probe per antibiotic class or resistance factor, more preferably at least 5 different gene probes, most preferably all known gene-coded resistance determinants in the target species.
- Generally, the DNA microarray of embodiment (1) comprises gene probes which are specific for a microbial species, bacterial/fungal species or a group of microorganisms to be identified. Said gene probes are preferably DNA sequences selected from three different groups, namely (a) species specific gene probes; (b) virulence gene probes; and/or (c) resistance gene probes.
- Preferably, the species specific set of gene probes for each species to be identified and characterised is selected from species specific gene probes (a) for
- (i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *stpC*, *fnbA*, *femA*, *fmhB*, *fmhA*;
 - (ii) *Escherichia coli* including gene probes derived from *b1169*, *fliCb*, *nfrB*, *yachI*, *ycdS*, *yciQ*, *shuA*;
 - (iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*, *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;
 - (iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;

- (v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*, *agrC2Stalugd*, *slamStalugd*;
- (vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;
- 5 (vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;
- (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;
- (ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*,
 10 *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*, *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;
- (x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*,
 15 *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebsA*, *ebsB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCb2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*, *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;
- (xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*,
 20 *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;
- (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yojH*, *liac*;
- 25 (xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;
- (xiv) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;
- 30 (xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*, *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*,

- cps23fGStrpneu*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneu*, *hexB1*, *hftsHStrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*,
5 *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneu*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneu*, *wci4Strpneu*, *wciK4Strpneu*, *wciL4Strpneu*, *wciN6bStrpneu*, *wciO6bStrpneu*, *wciP6bStrpneu*, *wciY18Strpneu*, *wzdbStrpneu*,
10 *wze6bStrpneu*, *wzy18Strpneu*, *wzy4Strpneu*, *wzy6bStrpneu*, *xpt*;
(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStrgal*, *cpsJStrgal*, *cpsKStrgal*, *cpsMStrgal*, *cpsYStrgal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*,
15 *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*, *0504Straga*, *folDStraga*, *neuA1Strgal*, *neuB1Strgal*, *neuC1Strgal*, *neuD1Strgal*, *recNStraga*, *ileSStraga*;
(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog*, *fah_rph_hlo_Strpyog*, *int*, *int315.5*, *oppD*, *SPy0382Strpyog*, *SPy0390Strpyog*,
20 *SpyM3_1351*, *vicXStrpyog*;
(xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut*, *580SSstprmut*, *581_582SSstprmut*, *584SSstprmut*, *dltAStprmut*, *dltBStprmut*, *dltCpplx1Stprmut*, *dltDStprmut*, *lichStrbov*, *lytRStprmut*, *lytSSstprmut*, *pepQStprmut*, *pflCStprmut*, *recNStprmut*, *ytqBStprmut*;
25 (xix) *Proteus mirabilis* including gene probes derived from *atfA*, *atfB*, *atfC*, *ccmPrmi1*, *cyaPrmi*, *flfB*, *flfD*, *flfN*, *flhD*, *floA*, *ftsK*, *gstB*, *hemCPrmi*, *hemDPrmi*, *hev*, *katA*, *lpp1*, *menE*, *mfd*, *nrpA*, *nrpB*, *nrpG*, *nrpS*, *nrpT*, *nrpU*, *pat*, *pmfA*, *pmfC*, *pmfE*, *ppaA*, *rsbA*, *rsbC*, *speB*, *stmA*, *stmB*, *terA*, *terD*, *umoA*, *umoB*, *umoC*, *ureR*, *xerC*, *ygbA*;
30 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu*, *frdC*, *frdD*, *lad*, *tna2*;
(xxi) *Acinetobacter baumannii* including gene probes derived from *carO*, *gacS*, *dhbA*, *dhbB*, *sid*, *csuD*, *csuC*, *tnp-ACIBA*, *waaA-ACIBA*, *csuB*, *csuA_B*, *csuA*, *put1*, *por*, *abc*, *furACIBA*, *dec*, *cysI*, *trpE*, *put3*, *ompA-ACIBA*.

Preferably, the virulence specific set of gene probes for each species to be identified and characterised is selected from virulence gene probes (b) for

- (i) *Staphylococcus aureus* including gene probes derived from *bsaE*, *bsaG*, *cap5h*, *cap5i*, *cap5j*, *cap5k*, *cap8H*, *cap8I*, *cap8J*, *cap8K*, *I-hld*, *I-hysA*, *I-IgGbg*, *EDIN*, *eta*,
5 *etb*, *hglA*, *hglB*, *hglC*, *hla*, *hlyA*, *hlyB*, *lukF*, *lukS*, *NAG*, *sak*, *sea*, *seb*, *sec1*, *seg*, *seh*, *sel*,
set15, *set6*, *set7*, *set8*, *sprV8*, *tst*, *I-sdrC*, *I-sdrD*, *I-sdrE*;
- (ii) *Escherichia coli* including gene probes derived from *b1202*, *eae*, *eltB*, *escR*,
escT, *escU*, *espB*, *fes*, *fteA*, *hlyA*, *hlyB*, *iucA*, *iucB*, *iucC*, *papG*, *rfaE*, *shuA*, *SLTII*,
toxA-LTPA, *VT2vaB*;
- 10 (iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD*, *hld_orf5*,
icaC, *icaD*, *icaR*, *psm_beta1and2*, *purR*, *spoVG*, *yabJ*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt*;
- (v) *Staphylococcus lugdunensis* including gene probes derived from *fbIStalugd*,
slushABCStalugd;
- 15 (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1*, *CDC28*, *CLN2*,
CPH1, *CYB1*, *EFG1*, *MNT1*, *RBF1*, *RBF1*, *RIM101*, *RIM8*, *SEC14*, *SEC4*, *TUP1*, *YPT1*,
ZNF1CZF1;
- (viii) *Enterococcus faecalis* including gene probes derived from *asa1*, *asp1*, *cgh*,
20 *cylA*, *cylB*, *cylI*, *cylL_cylS*, *cylM*, *ace*, *ef00108*, *ef00109*, *ef00111*, *ef00113*, *ef0012*,
ef0022, *ef0031*, *ef0032*, *ef0040*, *ef0058*, *enlA*, *esa*, *esp*, *gelE*, *groEL*, *groES*, *rt1*,
sala, *salb*, *sea1*, *sep1*, *vick*, *yycH*, *yycI*, *yycJ*;
- (ix) *Enterococcus faecium* including gene probes derived from *entA_entI*, *entD*,
entR, *oep*, *sagA*;
- 25 (x) *Klebsiella pneumonia* including gene probes derived from *cim*, *aldA*, *hemly*,
pSL017, *pSL020*, *rcaA*, *rmlC*, *rmlD*, *waaG*, *wbbD*, *wbbM*, *wbbN*, *wbdA*, *wbdC*,
wztKpn, *yibD*;
- (xi) *P. aeruginosa* including gene probes derived from *aprA*, *aprE*, *ctx*, *algB*, *algN*,
algR, *ExoS*, *fpvA*, *lasRa*, *lipA*, *lipH*, *Orf159*, *Orf252*, *pchG*, *PhzA*, *PhzB*, *PLC*, *plcN*,
30 *plcR*, *pvdD*, *pvdF*, *pyocinS1*, *pyocinS1im*, *pyocinS2*, *pys2*, *rbf303*, *rhlA*, *rhlB*, *rhlR*,
TnAP41, *toxA*;
- (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu*,
lytA, *nanA*, *nanBStrpneu*, *pcpCStrpneu*, *ply*, *prtAStrpneu*, *pspA*, *SP0834Strpneu*,
sphtraStrpneu, *wciJStrpneu*, *wziyStrpneu*, *wzxStrpneu*;

(xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor*, *0499Straga*, *hylStragal*, *lipStragal*;

(xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStropyog*, *fba2Stropyog*, *fhuAStropyog*, *fhuB1Stropyog*, *fhuDStropyog*, *fhuGStropyog*, *hyla*, *hylP*,
 5 *hyLP2*, *oppB*, *ropB*, *scpAStropyog*, *sloStropyog*, *smez- Stropyog*, *sof*, *speA*,
speB2Stropyog, *speCStropyog*, *speJStropyog*, *srtBStropyog*, *srtCStropyog*, *srtEStropyog*,
srtFStropyog, *srtGStropyog*, *srtIStropyog*, *srtKStropyog*, *srtRStropyog*, *srtTStropyog*,
vickKStropyog;

(xv) *Streptococcus mutans* including gene probes derived from *hlyXStrmut*,
 10 *perMStrmut*;

(xvi) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*,
hpmB, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*,
patA, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*.

Preferably, the resistance specific set of gene probes is selected from resistance
 15 gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *blaIMP-7*,
mecISepid, *blaOXA-10*, *blaB*, *ampC*, *I-blaR*, *blaOXA-32*, *bla-CTX-M-22*,
pbp2aStrpneu, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *I-mecR*, *blaOXY*,
dacCStropyog, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*,
 20 *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *I-mecI*, *pbp1a*, *I-blaI*, *blaTEM-106*,
blaOXY-KLOX, *ftsWEF*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *mecR1Sepid*, *blaZ*,
blaOXA-1, *fox-6*, *blaPrmi*;

(ii) aminoglycosides resistance including gene probes derived from
aacA_aphDStwar, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*,
 25 *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*; *aacA4ENCL*, *aac(6p)-Ib7*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes
 derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *satA*, *msrA*, *mphBM*,
mefA, *mrx*;

(iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;

(v) chloramphenicol resistance including gene probes derived from *cat*,
 30 *catEfaecium*, *cmIA5*;

(vi) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*;

(vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;

(viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *albA*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;

(ix) fungicides resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

Most preferably, the resistance specific set of gene probes is selected from resistance gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *bla-CTX-M-22*, *blaSHV-1*, *blaTEM-106*, *mecA*, *blaZ*;

(ii) aminoglycosides resistance including gene probes derived from *aacC1*, *aacC2*, *aadA*, *aadB*, *aadD*, *aacA4*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *aphA3*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermA*, *ermB*, *ermC*;

(iv) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*

(vii) glycopeptides resistance including gene probes derived from *vanA*, *vanB*, *vanC-2*.

The most relevant resistance gene probes are probes derived from and specific for *mecA*. This is due to the fact that *mecA* is common to all Staphylococci including *S. aureus* and CoNS.

Since the same resistance phenotype is determined by many different genotypes, it is preferred to use a plurality of resistance gene probes for unambiguous and comprehensive prediction of antibiotic resistance. The largest available set of resistance probes is most preferred.

For the virulence assessment of a certain strain and the sub-species strain discrimination, it is preferred to use a plurality of virulence gene probes for unambiguous and comprehensive virulence determination. The use of the highest available number of genotypic markers is most favourable.

Furthermore, the microarray may contain a set of gene probes which serve as controls. Preferably, such a set of control gene probes is selected from group (d) consisting of control gene probes coding for

- 5 (i) negative controls, namely DNA sequences which will not hybridise with human DNA or bacterial, fungal or the microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from plant genes, more preferably from *Arabidopsis thaliana* or *Glycine max* genes;
- 10 (ii) positive controls including segments of ribosomal DNA from bacterial target species, preferably 16S DNA, and segments of conserved human genes;
- (iii) positive controls specific for DNA added to the sample ("spiked DNA"), namely DNA sequences which will not hybridise with human DNA or the fungal, bacterial or microbial target DNA under the hybridisation conditions of the method of present
15 invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from mouse or amoeba genes, most preferably from *Mus musculus* or *Dictyostelium discoideum* genes.

These control gene probes are necessary to

- 20 a) detect non-specific hybridisation;
- b) optimise hybridisation conditions and image acquisition and analysis;
- c) provide positive controls for the quality of probe preparation, hybridisation and detection; and/or
- d) control technical aspects of the entire detection procedure including
25 labelling, hybridisation and detection steps.

In a preferred aspect of embodiment (1), the microarray contains DNA sequences selected from the group consisting of the SEQ ID NOs: 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof as gene probes.

- 30 More preferably, in order to identify a specific microbial species, bacterial species or group of bacteria, the gene probes of group (a) are selected from SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-

2863, 2902 and 2903 (compare Tab. 1). Equally, in order to determine virulence of a specific micororganism or bacterial species, the gene probes of group (b) are selected from SEQ ID NO: 100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784 (compare Tab. 1). Equally, in order to determine antibiotic resistance of a specific microbial or bacterial species, the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908 (compare Tab. 1). Equally, in order to provide the required controls (negative, positive, hybridisation controls), the gene probes of group (d) are selected from SEQ ID NO:919-947, preferably from SEQ ID NO:919-925 and 944-947, more preferably from SEQ ID NO: 919 and 921 (compare Tab. 1).

Tab. 1: Preferred gene probes for species identification, virulence determination and resistance determination of microorganisms

15 **a) probes for species identification**

| SEQ ID NO | Probe |
|-----------|--------------|
| 1 | cataSaur_1_1 |
| 2 | cataSaur_1_2 |
| 3 | clfA_1_1 |
| 4 | clfB_1_1 |
| 5 | coa_1_1 |
| 6 | coa_1_2 |
| 7 | I-clpC_1_1 |
| 8 | I-clpP_1_1 |
| 9 | I-ctaA_1_1 |
| 10 | I-ctsR_1_1 |
| 11 | I-dltA_1_1 |
| 12 | I-dltB_1_1 |
| 13 | I-dltC_1_1 |
| 14 | I-dnaK_1_1 |
| 15 | I-elkT_1_1 |
| 16 | I-femD_1_1 |
| 17 | I-glnA_1_1 |
| 18 | I-glnR_1_1 |
| 19 | I-grlA_1_1 |
| 20 | I-grlB_1_1 |
| 21 | I-groEL_1_1 |
| 22 | I-groES_1_1 |
| 23 | I-hemA_1_1 |
| 24 | I-hemE_1_1 |
| 25 | I-hemH_1_1 |
| 26 | I-hemL_1_1 |
| 27 | I-hemY_1_1 |
| 28 | I-lepA_1_1 |

| SEQ ID NO | Probe |
|-----------|---------------|
| 29 | I-lrgA_1_1 |
| 30 | I-lrgB_1_1 |
| 31 | I-lytM_1_1 |
| 32 | I-menB_1_1 |
| 33 | I-menD_1_1 |
| 34 | I-menE_1_1 |
| 35 | I-menF_1_1 |
| 36 | I-mreB_1_1 |
| 37 | I-mreR_1_1 |
| 38 | I-mutL_1_1 |
| 39 | I-mutS_1_1 |
| 40 | I-NAG_1_1 |
| 41 | I-pbg_1_1 |
| 42 | I-pbpF_1_1 |
| 43 | I-pdhB_1_1 |
| 44 | I-pdhC_1_1 |
| 45 | I-rsbU_1_1 |
| 46 | I-rsbV_1_1 |
| 47 | I-rsbW_1_1 |
| 48 | I-sgp_1_1 |
| 49 | I-sirR_1_1 |
| 50 | I-sodA_1_1 |
| 51 | I-sodB_1_1 |
| 52 | I-sstA_1_1 |
| 53 | I-sstB_1_1 |
| 54 | I-sstC_1_1 |
| 55 | I-sstD_1_1 |
| 56 | I-trx_1_1 |
| 57 | I-yhiN_1_1 |
| 58 | epiP-bsaP_1_1 |
| 59 | geh_1_1 |
| 60 | gyrA_1_1 |
| 61 | gyrB_1_1 |
| 62 | hemB_1_1 |
| 63 | hemC_1_1 |
| 64 | hemD_1_1 |
| 65 | hemN_1_1 |
| 66 | hsdS_1_1 |
| 67 | hsdS_2_1 |
| 68 | lip_1_1 |
| 69 | menC_1_1 |
| 70 | murC_1_1 |
| 71 | nuc_1_1 |
| 72 | pdhD_1_1 |
| 73 | rpoB_1_1 |
| 74 | SAV0431_1_1 |
| 75 | SAV0439_1_1 |
| 76 | SAV0440_1_1 |
| 77 | SAV0441_1_1 |
| 78 | sigB_1_1 |
| 79 | spa_1_2 |
| 80 | sstC_1_1 |
| 81 | tag_1_1 |

| SEQ ID NO | Probe |
|------------------|-----------------|
| 82 | tyrA_1_1 |
| 83 | I-aroC_1_1 |
| 84 | I-aroA_1_1 |
| 85 | I-cna_1_1 |
| 86 | I-ebpS_1_1 |
| 87 | I-eno_1_1 |
| 88 | I-fbpA_1_1 |
| 89 | I-fib_1_1 |
| 90 | I-fnbB_1_1 |
| 91 | I-srtA_1_1 |
| 92 | I-stpC_1_1 |
| 93 | I-fnbA_1_1 |
| 94 | I-spa_1_1 |
| 95 | I-aroE_1_1 |
| 96 | I-aroF_1_1 |
| 97 | I-aroG_1_1 |
| 98 | I-asp23_1_1 |
| 99 | I-atl_1_1 |
| 142 | b1169_1_1 |
| 143 | envZ_1_1 |
| 144 | fliCb_1_1 |
| 145 | nfrB_1_1 |
| 146 | nlpA_1_1 |
| 147 | pilAe_1_1 |
| 148 | yacH_1_1 |
| 149 | yagX_1_1 |
| 150 | ycdS_1_1 |
| 151 | yciQ_1_1 |
| 152 | ymcA_1_1 |
| 174 | ardeSE0106_1_1 |
| 175 | ardeSE0107_1_1 |
| 176 | aroI SE0105_1_1 |
| 177 | atIE_1_1 |
| 178 | agrB_1_1 |
| 179 | agrC_1_1 |
| 180 | alphSE1368_1_1 |
| 181 | gad_1_1 |
| 182 | glucSE1191_1_1 |
| 183 | hsp10_1_1 |
| 184 | icaA_1_1 |
| 185 | icaB_1_1 |
| 186 | mvaSSepid_1_1 |
| 187 | nitreSE1972_1_1 |
| 188 | nitreSE1974_1_1 |
| 189 | nitreSE1975_1_1 |
| 190 | oiamtSE1209_1_1 |
| 191 | ORF1Sepid_1_1 |
| 192 | ORF3bSepid_1_1 |
| 193 | qacR_1_1 |
| 194 | sin_1_1 |
| 195 | ureSE1861_1_1 |
| 196 | ureSE1863_1_1 |
| 197 | ureSE1864_1_1 |

| SEQ ID NO | Probe |
|-----------|------------------------|
| 198 | ureSE1865_1_1 |
| 199 | ureSE1867_1_1 |
| 209 | folQShaemolyt_1_1 |
| 210 | mvaCShaemolyticus_1_1 |
| 211 | mvaDShaemolyt_1_1 |
| 212 | mvaK1Shaemolyticus_1_1 |
| 213 | mvaSShaemolyticus_1_1 |
| 214 | RNApolsigm_1_1 |
| 216 | agrB2Stalugd_1_1 |
| 217 | agrC2Stalugd_1_1 |
| 218 | agrCStalugd_1_1 |
| 219 | slamStalugd_1_1 |
| 222 | RNApolsigmSsapro_1_1 |
| 223 | RNApolsigmSsapro_1_2 |
| 224 | msrw1Stwar_1_1 |
| 225 | nukMStwar_1_1 |
| 226 | proDStwar_1_1 |
| 227 | proMStwar_1_1 |
| 228 | sigrpoStwar_1_1 |
| 229 | tnpStwar_1_1 |
| 231 | ARG56_1_1 |
| 232 | ASL43f_1_1 |
| 233 | BGL2_1_1 |
| 234 | CACHS3_1_1 |
| 235 | CCT8_1_1 |
| 236 | CDC37_1_1 |
| 237 | CEF3_1_1 |
| 238 | CHS1_1_1 |
| 239 | CHS2_1_1 |
| 240 | CHS4_1_1 |
| 241 | CHS5_1_1 |
| 242 | CHT1_1_1 |
| 243 | CHT2_1_1 |
| 244 | CHT4_1_1 |
| 245 | CSA1_1_1 |
| 246 | 5triphosphatase_1_1 |
| 247 | AAF1_1_1 |
| 248 | ADH1_1_1 |
| 249 | ALS1_1_1 |
| 250 | ALS7_1_1 |
| 251 | EDT1_1_1 |
| 252 | ELF_1_1 |
| 253 | ESS1_1_1 |
| 254 | FAL1_1_1 |
| 255 | GAP1_1_1 |
| 256 | GNA1_1_1 |
| 257 | GSC1_1_1 |
| 258 | GSL1_1_1 |
| 259 | HIS1_1_1 |
| 260 | HTS1_1_1 |
| 261 | HWP1_2_1 |
| 262 | HYR1_1_1 |
| 263 | INT1a_1_1 |

| SEQ ID NO | Probe |
|------------------|----------------|
| 264 | KRE15f_1_1 |
| 265 | KRE6_1_1 |
| 266 | KRE9_1_1 |
| 267 | MIG1_1_1 |
| 268 | MLS1_1_1 |
| 269 | MP65_1_1 |
| 270 | NDE1_1_1 |
| 271 | PFK2_1_1 |
| 272 | PHR1_1_1 |
| 273 | PHR2_1_1 |
| 274 | PHR3_1_1 |
| 275 | PRA1_1_1 |
| 276 | PRS1_1_1 |
| 277 | RBT1_1_1 |
| 278 | RBT4_1_1 |
| 279 | RHO1_1_1 |
| 280 | RNR1_1_1 |
| 281 | RPB7_1_1 |
| 282 | RPL13_1_1 |
| 283 | RVS167_1_1 |
| 284 | SHA3_1_1 |
| 285 | SKN1_1_1 |
| 286 | SRB1_1_1 |
| 287 | TCA1_1_1 |
| 288 | TRP1_1_1 |
| 289 | YAE1_1_1 |
| 290 | YRB1_1_1 |
| 291 | YST1exon2_1_1 |
| 308 | arcA_1_1 |
| 309 | arcC_1_1 |
| 310 | bkdA_1_1 |
| 311 | cad_1_1 |
| 312 | camE1_1_1 |
| 313 | csrA_1_1 |
| 314 | dacA_1_1 |
| 315 | dfr_1_1 |
| 316 | dhoD1a_1_1 |
| 317 | ABC-eltA_1_1 |
| 318 | agrBfs_1_1 |
| 319 | agrCfs_1_1 |
| 320 | dnaE_1_1 |
| 321 | ebsA_1_1 |
| 322 | ebsB_1_1 |
| 323 | eep_1_1 |
| 324 | efaR_1_1 |
| 325 | glS24_glsB_1_1 |
| 326 | gph_1_1 |
| 327 | gyrAEf_1_1 |
| 328 | metEf_1_1 |
| 329 | mntHCb2_1_1 |
| 330 | mob2_1_1 |
| 331 | mvaD_1_1 |
| 332 | mvaE_1_1 |

| SEQ ID NO | Probe |
|-----------|---------------------|
| 333 | parC_1_1 |
| 334 | pcfG_1_1 |
| 335 | phoZ_1_1 |
| 336 | polC_1_1 |
| 337 | ptb_1_1 |
| 338 | recS1_1_1 |
| 339 | rpoN_1_1 |
| 340 | tms_1_1 |
| 341 | tyrDC_1_1 |
| 342 | tyrS_1_1 |
| 377 | bglB_1_1 |
| 378 | bglR_1_1 |
| 379 | bglS_1_1 |
| 380 | efmA_1_1 |
| 381 | efmB_1_1 |
| 382 | efmC_1_1 |
| 383 | mreC_1_1 |
| 384 | mreD_1_1 |
| 385 | mvaDEfaecium_1_1 |
| 386 | mvaEEfaecium_1_1 |
| 387 | mvaK1Efaecium_1_1 |
| 388 | mvaK2Efaecium_1_1 |
| 389 | mvaSEfaecium_1_1 |
| 390 | orf3_4Efaeciumb_1_1 |
| 391 | orf6_7Efaecium_1_1 |
| 392 | orf7_8Efaecium_1_1 |
| 393 | orf9_10Efaecium_1_1 |
| 399 | atsA_1_1 |
| 400 | atsB_1_1 |
| 401 | budC_1_1 |
| 402 | citA_1_1 |
| 403 | citW_1_1 |
| 404 | citX_1_1 |
| 405 | dalD_1_1 |
| 406 | dalK_1_1 |
| 407 | dalT_1_1 |
| 408 | acoA_1_1 |
| 409 | acoB_1_1 |
| 410 | acoC_1_1 |
| 411 | ahIK_1_1 |
| 412 | fimK_1_1 |
| 413 | glfKPN2_1_1 |
| 414 | ltrA_1_1 |
| 415 | mdcC_1_1 |
| 416 | mdcF_1_1 |
| 417 | mdcH_1_1 |
| 418 | mrkA_1_1 |
| 419 | mtrK_1_1 |
| 420 | nifF_1_1 |
| 421 | nifK_1_1 |
| 422 | nifN_1_1 |
| 423 | tyrP_1_1 |
| 424 | ureA_1_1 |

| SEQ ID NO | Probe |
|-----------|------------------|
| 425 | wbbO_1_1 |
| 426 | wza_1_1 |
| 427 | wzb_1_1 |
| 428 | wzmKPN2_1_1 |
| 429 | wztKPN2_1_1 |
| 430 | yojH_1_1 |
| 431 | liac_1_1 |
| 449 | cymA_1_1 |
| 450 | cymD_1_1 |
| 451 | cymE_1_1 |
| 452 | cymH_1_1 |
| 453 | cymI_1_1 |
| 454 | cymJ_1_1 |
| 455 | ddrA_1_1 |
| 456 | fdt-1_1_1 |
| 457 | fdt-2_1_1 |
| 458 | fdt-3_1_1 |
| 459 | gatY_1_1 |
| 460 | hydH_1_1 |
| 461 | masA_1_1 |
| 462 | nasA_1_1 |
| 463 | nasE_1_1 |
| 464 | nasF_1_1 |
| 465 | pehX_1_1 |
| 466 | pelX_1_1 |
| 467 | tagH_1_1 |
| 468 | tagK_1_1 |
| 469 | tagT_1_1 |
| 470 | glpR_1_1 |
| 471 | lasRb_1_1 |
| 472 | OrfX_1_1 |
| 473 | pa0260_1_1 |
| 474 | pa0572_1_1 |
| 475 | pa0625_1_1 |
| 476 | pa0636_1_1 |
| 477 | pa1046_1_1 |
| 478 | pa1069_1_1 |
| 479 | pa1846_1_1 |
| 480 | pa3866_1_1 |
| 481 | pa4082_1_1 |
| 482 | pilAp_1_1 |
| 483 | PilAp2_1_1 |
| 484 | pilC_1_1 |
| 485 | PstP_1_1 |
| 486 | purK_1_1 |
| 487 | uvrDII_1_1 |
| 488 | vsmI_1_1 |
| 489 | vsmR_1_2 |
| 490 | xcpX_1_1 |
| 523 | cap1EStrpneu_1_1 |
| 524 | cap1FStrpneu_1_1 |
| 525 | cap1GStrpneu_1_1 |
| 526 | cap3AStrpneu_1_1 |

| SEQ ID NO | Probe |
|-----------|------------------------|
| 527 | cap3BStrpneu_1_1 |
| 528 | celAStrpneu_1_1 |
| 529 | celBStrpneu_1_1 |
| 530 | cglAStrpneu_1_1 |
| 531 | cglBStrpneu_1_1 |
| 532 | cglCStrpneu_1_1 |
| 533 | cglDStrpneu_1_1 |
| 534 | cinA_1_1 |
| 535 | cps14EStrpneum_1_1 |
| 536 | cps14FStrpneum_1_1 |
| 537 | cps14GStrpneum_1_1 |
| 538 | cps14HStrpneum_1_1 |
| 539 | cps19aHStrpneum_1_1 |
| 540 | cps19aIStrpneum_1_1 |
| 541 | cps19aKStrpneum_1_1 |
| 542 | cps19fGStrpneum_1_1 |
| 543 | cps23fGStrpneum_1_1 |
| 544 | dexB_1_1 |
| 545 | dinF_1_1 |
| 546 | 1760Strpneu_1_1 |
| 547 | acyPStrpneu_1_1 |
| 548 | endAStrpneu_1_1 |
| 549 | exoAStrpneu_1_1 |
| 550 | exp72_1_1 |
| 551 | fnlAStrpneu_1_1 |
| 552 | fnlBStrpneu_1_1 |
| 553 | fnlCStrpneu_1_1 |
| 554 | gct18Strpneum_1_1 |
| 555 | hexB1_1_1 |
| 556 | hftsHstrpneu_1_1 |
| 557 | immunofrag1Strpneu_1_1 |
| 558 | immunofrag2Strpneu_2_1 |
| 559 | immunofrag3Strpneu_2_1 |
| 560 | kdtBStrpneu_1_1 |
| 561 | lysAStrpneu_1_1 |
| 562 | pcpBStrpneu_1_1 |
| 563 | pflCStrpneu_1_1 |
| 564 | plpA_1_1 |
| 565 | prtA1Strpneu_1_1 |
| 566 | pspC1Strpneu_1_1 |
| 567 | pspC2_1_1 |
| 568 | purRStrpneu_1_1 |
| 569 | pyrDAstrpneum_1_1 |
| 570 | SP0828Strpneu_1_1 |
| 571 | SP0830Strpneu_1_1 |
| 572 | SP0833Strpneu_1_1 |
| 573 | SP0837_38Strpneu_1_1 |
| 574 | SP0839Strpneu_1_1 |
| 575 | ugdStrpneu_1_1 |
| 576 | uncC_1_1 |
| 577 | vicXStrepneu_1_1 |
| 578 | wchA6bStrpneum_1_1 |
| 579 | wci4Strpneum_1_1 |

| SEQ ID NO | Probe |
|-----------|-------------------------|
| 580 | wciK4Strpneum_1_1 |
| 581 | wciL4Strpneum_1_1 |
| 582 | wciN6bStrpneum_1_1 |
| 583 | wciO6bStrpneum_1_1 |
| 584 | wciP6bStrpneum_1_1 |
| 585 | wciY18Strpneum_1_1 |
| 586 | wzdbStrpneum_1_1 |
| 587 | wze6bStrpneum_1_1 |
| 588 | wzy18Strpneum_1_1 |
| 589 | wzy4Strpneum_1_1 |
| 590 | wzy6bStrpneum_1_1 |
| 591 | xpt_1_1 |
| 606 | cpsA1Strgal_1_1 |
| 607 | cpsB1Strgal_1_1 |
| 608 | cpsC1Strgal_1_1 |
| 609 | cpsD1Strgal_1_1 |
| 610 | cpsE1Strgal_1_1 |
| 611 | cpsG1Strgal_1_1 |
| 612 | cpsIStrgal_1_1 |
| 613 | cpsJStrgal_1_1 |
| 614 | cpsKStrgal_1_1 |
| 615 | cpsMStrgal_1_1 |
| 616 | cpsYStrgal_1_1 |
| 617 | cpsYStrgal_2_1 |
| 618 | cylBStraga_1_1 |
| 619 | cylEStraga_1_1 |
| 620 | cylFStraga_1_1 |
| 621 | cylHStraga_1_1 |
| 622 | cylIStraga_1_1 |
| 623 | cylJStraga_1_1 |
| 624 | cylKStraga_1_1 |
| 625 | 0487Straga_1_1 |
| 626 | 0488Straga_1_1 |
| 627 | 0493Straga_1_1 |
| 628 | 0495Straga_1_1 |
| 629 | 0498Straga_1_1 |
| 630 | 0500Straga_1_1 |
| 631 | 0502Straga_1_1 |
| 632 | 0504Straga_1_1 |
| 633 | folDStraga_1_1 |
| 634 | neuA1Strgal_1_1 |
| 635 | neuB1Strgal_1_1 |
| 636 | neuC1Strgal_1_1 |
| 637 | neuD1Strgal_1_1 |
| 638 | recNStraga_1_1 |
| 639 | ileSStraga_1_1 |
| 645 | cyclStrpyog_1_1 |
| 646 | fah_rph_hlo_Strpyog_1_1 |
| 647 | int_1_1 |
| 648 | int315.5_1_1 |
| 649 | murEStrpyog_1_1 |
| 650 | oppA_1_1 |
| 651 | oppCStrpyog_1_1 |

| SEQ ID NO | Probe |
|-----------|---------------------|
| 652 | oppD_1_1 |
| 653 | SPy0382Strpyog_1_1 |
| 654 | SPy0390Strpyog_1_1 |
| 655 | SpyM3_1351_1_1 |
| 656 | vicXStrpyog_1_1 |
| 687 | 573Stprmut_1_1 |
| 688 | 580SStprmut_1_1 |
| 689 | 581_582SStprmut_1_1 |
| 690 | 584SStprmut_1_1 |
| 691 | dltAStrmut_1_1 |
| 692 | dltBStrmut_1_1 |
| 693 | dltCpx1Strmut_1_1 |
| 694 | dltDStrmut_1_1 |
| 695 | lichStrbov_1_1 |
| 696 | lytRStprmut_1_1 |
| 697 | lytSStprmut_1_1 |
| 698 | pepQStrrmut_1_1 |
| 699 | pflCStrmut_1_1 |
| 700 | recNStprmut_1_1 |
| 701 | ytqBStrmut_1_1 |
| 706 | atfA_1_1 |
| 707 | atfB_1_1 |
| 708 | atfC_1_1 |
| 709 | ccmPrmi1_1_1 |
| 710 | cyaPrmi_1_1 |
| 711 | aad_1_1 |
| 712 | flfB_1_1 |
| 713 | flfD_1_1 |
| 714 | flfN_1_1 |
| 715 | flhD_1_1 |
| 716 | floA_1_1 |
| 717 | ftsK_1_1 |
| 718 | gstB_1_1 |
| 719 | hemCPrmi_1_1 |
| 720 | hemDPrmi_1_1 |
| 721 | hev_1_1 |
| 722 | katA_1_1 |
| 723 | lpp1_1_1 |
| 724 | menE_1_1 |
| 725 | mfd_1_1 |
| 726 | nrpA_1_1 |
| 727 | nrpB_1_1 |
| 728 | nrpG_1_1 |
| 729 | nrpS_1_1 |
| 730 | nrpT_1_1 |
| 731 | nrpU_1_1 |
| 732 | pat_1_1 |
| 733 | pmfA_1_1 |
| 734 | pmfC_1_1 |
| 735 | pmfE_1_1 |
| 736 | ppaA_1_1 |
| 737 | rsbA_1_1 |
| 738 | rsbC_1_1 |

| SEQ ID NO | Probe |
|-----------|----------------|
| 739 | speB_1_1 |
| 740 | stmA_1_1 |
| 741 | stmB_1_1 |
| 742 | terA_1_1 |
| 743 | terD_1_1 |
| 744 | umoA_1_1 |
| 745 | umoB_1_1 |
| 746 | umoC_1_1 |
| 747 | ureR_1_1 |
| 748 | xerC_1_1 |
| 749 | ygbA_1_1 |
| 776 | envZPrvu_1_1 |
| 777 | frdC_1_1 |
| 778 | frdD_1_1 |
| 779 | infBPrvu_1_1 |
| 780 | lad_1_1 |
| 781 | tna2_1_1 |
| 2843 | carO_1_1 |
| 2844 | gacS_1_1 |
| 2845 | dhbA_1_1 |
| 2846 | dhbB_1_1 |
| 2847 | sid_1_1 |
| 2848 | csuD_1_1 |
| 2849 | csuC_1_1 |
| 2850 | tnp-ACIBA_1_1 |
| 2851 | waaA-ACIBA_1_1 |
| 2852 | csuB_1_1 |
| 2853 | csuA_B_1_1 |
| 2854 | csuA_1_1 |
| 2855 | put1_1_1 |
| 2856 | por_1_1 |
| 2857 | abc_1_1 |
| 2858 | furACIBA_1_1 |
| 2859 | dec_1_1 |
| 2860 | cysI_1_1 |
| 2861 | trpE_1_1 |
| 2862 | put3_1_1 |
| 2863 | ompA-ACIBA_1_1 |
| 2902 | coa_3_1 |
| 2903 | coa_2_2 |
| 2876 | asr_1_1 |
| 2877 | lacZ_1_1 |
| 2878 | ehuS_1_1 |
| 2879 | ehuV_1_1 |
| 2880 | slyA_1_1 |
| 2881 | ORF165_1_1 |
| 2882 | ehuU_1_1 |
| 2883 | ehuT_1_1 |
| 2884 | ORF295_1_1 |
| 2885 | ehuA_1_1 |
| 2886 | ORF400_1_1 |
| 2887 | H+ATPase_1_1 |
| 2889 | smeE_1_1 |

| SEQ ID NO | Probe |
|-----------|-------------------|
| 2890 | eE_1_1 |
| 2891 | StmPr1_1_1 |
| 2892 | eD_2_1 |
| 2893 | ppi_1_1 |
| 2894 | pmp-STEMA_1_1 |
| 2895 | pam_1_1 |
| 2896 | ORF4-STEMA_1_1 |
| 2897 | ORF2-STEMA_1_1 |
| 2898 | et_1_1 |
| 2899 | eF_1_1 |
| 2900 | StmPr2_1_1 |
| 2901 | smeF4494_1_1 |
| 2904 | fasCAXStrdysg_1_1 |
| 2906 | ydhK_1_1 |

b) virulence probes

| SEQ ID NO | Probe |
|-----------|-------------|
| 100 | bsaE_1_1 |
| 101 | bsaG_1_1 |
| 102 | cap5h_1_1 |
| 103 | cap5i_1_1 |
| 104 | cap5j_1_1 |
| 105 | cap5k_1_1 |
| 106 | cap8H_1_1 |
| 107 | cap8I_1_1 |
| 108 | cap8J_1_1 |
| 109 | cap8K_1_1 |
| 110 | I-hld_1_1 |
| 111 | I-hysA_1_1 |
| 112 | I-IgGbg_1_1 |
| 113 | EDIN_1_1 |
| 114 | eta_1_1 |
| 115 | etb_1_1 |
| 116 | hglA_1_1 |
| 117 | hglA_2_1 |
| 118 | hglB_1_1 |
| 119 | hglC_2_1 |
| 120 | hla_1_1 |
| 121 | hlb_1_2 |
| 122 | lukF_1_1 |
| 123 | lukS_1_1 |
| 124 | lukS_2_1 |
| 125 | NAG_1_1 |
| 126 | sak_1_1 |
| 127 | sea_1_1 |
| 128 | seb_1_1 |
| 129 | sec1_1_1 |
| 130 | seg_1_1 |
| 131 | seh_1_1 |
| 132 | sel_1_1 |
| 133 | set15_1_1 |

| SEQ ID NO | Probe |
|-----------|---------------------|
| 134 | set6_1_1 |
| 135 | set7_1_1 |
| 136 | set8_1_1 |
| 137 | sprV8_1_1 |
| 138 | tst_1_1 |
| 139 | I-sdrC_1_1 |
| 140 | I-sdrD_1_1 |
| 141 | I-sdrE_1_1 |
| 153 | b1202_1_1 |
| 154 | eae_1_1 |
| 155 | eltB_1_1 |
| 156 | escR_1_1 |
| 157 | escT_1_1 |
| 158 | escU_1_1 |
| 159 | espB_1_1 |
| 160 | fes_1_1 |
| 161 | fes_2_1 |
| 162 | fteA_1_1 |
| 163 | hlyA_1_1 |
| 164 | hlyB_1_1 |
| 165 | iucA_1_1 |
| 166 | iucB_1_1 |
| 167 | iucC_1_1 |
| 168 | papG_1_1 |
| 169 | rfbE_1_1 |
| 170 | shuA_1_1 |
| 171 | SLTII_1_1 |
| 172 | toxA-LTPA_1_1 |
| 173 | VT2vaB_1_1 |
| 200 | gcaD_1_1 |
| 201 | hld_orf5_1_1 |
| 202 | icaC_1_1 |
| 203 | icaD_1_1 |
| 204 | icaR_1_1 |
| 205 | psm_beta1and2_1_1 |
| 206 | purR_1_1 |
| 207 | spoVG_1_1 |
| 208 | yabJ_1_1 |
| 215 | lipShaemolyt_1_1 |
| 220 | fblStalugd_1_1 |
| 221 | slushABCStalugd_1_1 |
| 230 | gehASTwar_1_1 |
| 292 | CCN1_1_1 |
| 293 | CDC28_1_1 |
| 294 | CLN2_1_1 |
| 295 | CPH1_1_1 |
| 296 | CYB1_1_1 |
| 297 | EFG1_1_1 |
| 298 | MNT1_1_1 |
| 299 | RBF1_1_1 |
| 300 | RBF1_2_1 |
| 301 | RIM101_1_1 |
| 302 | RIM8_1_1 |

| SEQ ID NO | Probe |
|-----------|---------------|
| 303 | SEC14_1_1 |
| 304 | SEC4_1_1 |
| 305 | TUP1_1_1 |
| 306 | YPT1_1_1 |
| 307 | ZNF1CZF1_2_1 |
| 343 | asa1_1_1 |
| 344 | asp1_1_1 |
| 345 | cgh_1_1 |
| 346 | cylA_1_1 |
| 347 | cylB_1_1 |
| 348 | cylI_1_1 |
| 349 | cylL_cylS_1_1 |
| 350 | cylM_1_1 |
| 351 | ace_1_1 |
| 352 | ef00108_1_1 |
| 353 | ef00109_1_1 |
| 354 | ef0011_1_1 |
| 355 | ef00113_1_1 |
| 356 | ef0012_1_1 |
| 357 | ef0022_1_1 |
| 358 | ef0031_1_1 |
| 359 | ef0032_1_1 |
| 360 | ef0040_1_1 |
| 361 | ef0058_1_1 |
| 362 | enlA_1_1 |
| 363 | esa_1_1 |
| 364 | esp_1_1 |
| 365 | geIE_1_1 |
| 366 | groEL_1_1 |
| 367 | groES_1_1 |
| 368 | rt1_1_1 |
| 369 | sala_1_1 |
| 370 | salb_1_1 |
| 371 | sea1_1_1 |
| 372 | sep1_1_1 |
| 373 | vick_1_1 |
| 374 | yycH_1_1 |
| 375 | yycI_1_1 |
| 376 | yycJ_1_1 |
| 394 | entA_entI_1_1 |
| 395 | entD_1_1 |
| 396 | entR_1_1 |
| 397 | oep_1_1 |
| 398 | sagA_1_2 |
| 432 | cim_1_1 |
| 433 | aldA_1_1 |
| 434 | aldA_2_1 |
| 435 | hemly_1_1 |
| 436 | pSL017_1_1 |
| 437 | pSL020_1_1 |
| 438 | rcaA_1_1 |
| 439 | rmlC_1_1 |
| 440 | rmlD_1_1 |

| SEQ ID NO | Probe |
|-----------|-------------------|
| 441 | waaG_1_1 |
| 442 | wbbD_1_1 |
| 443 | wbbM_1_1 |
| 444 | wbbN_1_1 |
| 445 | wbdA_1_1 |
| 446 | wbdC_1_1 |
| 447 | wztKpn_1_1 |
| 448 | yibD_1_1 |
| 491 | aprA_1_1 |
| 492 | aprE_1_1 |
| 493 | ctx_1_2 |
| 494 | algB_1_1 |
| 495 | algN_1_1 |
| 496 | algR_1_1 |
| 497 | ExoS_1_1 |
| 498 | fpvA_1_1 |
| 499 | lasRa_1_1 |
| 500 | lipA_1_1 |
| 501 | lipH_1_1 |
| 502 | Orf159_1_2 |
| 503 | Orf252_1_1 |
| 504 | pchG_1_1 |
| 505 | PhzA_1_1 |
| 506 | PhzB_1_1 |
| 507 | PLC_1_1 |
| 508 | plcN_1_1 |
| 509 | plcR_1_1 |
| 510 | pvdD_1_1 |
| 511 | pvdF_1_2 |
| 512 | pyocinS1_1_1 |
| 513 | pyocinS1im_1_1 |
| 514 | pyocinS2_1_1 |
| 515 | pys2_1_1 |
| 516 | pys2_2_1 |
| 517 | rbf303_1_1 |
| 518 | rhIA_1_1 |
| 519 | rhIB_1_1 |
| 520 | rhIR_1_1 |
| 521 | TnAP41_1_2 |
| 522 | toxA_1_1 |
| 592 | igaStrpneu_1_1 |
| 593 | lytA_1_1 |
| 594 | nanA_1_1 |
| 595 | nanBStrpneu_1_1 |
| 596 | pcpCStrpneu_1_1 |
| 597 | ply_1_1 |
| 598 | prtAStrpneu_1_1 |
| 599 | pspA_1_2 |
| 600 | SP0834Strpneu_1_1 |
| 601 | SP0834Strpneu_1_2 |
| 602 | sphtraStrpneu_1_1 |
| 603 | wciJStrpneu_1_1 |
| 604 | wziyStrpneu_1_1 |

| SEQ ID NO | Probe |
|-----------|-------------------|
| 605 | wzxStrpneu_1_1 |
| 640 | CAMPfactor_1_1 |
| 641 | CAMPfactor_2_1 |
| 642 | 0499Straga_1_1 |
| 643 | hylStragal_1_1 |
| 644 | lipStragal_1_1 |
| 657 | DNaseIStrpyog_1_1 |
| 658 | fba2Strpyog_1_1 |
| 659 | fhuAStrpyog_1_1 |
| 660 | fhuB1Strpyog_1_1 |
| 661 | fhuDStrpyog_1_1 |
| 662 | fhuGStrpyog_1_1 |
| 663 | hyla_1_1 |
| 664 | hylP_1_1 |
| 665 | hylp2_1_1 |
| 666 | oppB_1_1 |
| 667 | ropB_1_1 |
| 668 | scpAStrpyog_1_1 |
| 669 | sloStrpyog_1_1 |
| 670 | smez-4Strpyog_1_1 |
| 671 | sof_1_1 |
| 672 | sof_2_1 |
| 673 | speA_1_1 |
| 674 | speB2Strpyog_1_1 |
| 675 | speCStrpyog_1_1 |
| 676 | speJStrpyog_1_1 |
| 677 | srtBStrpyog_1_1 |
| 678 | srtCStrpyog_1_1 |
| 679 | srtEStrpyog_1_1 |
| 680 | srtFStrpyog_1_1 |
| 681 | srtGStrpyog_1_1 |
| 682 | srtIStrpyog_1_1 |
| 683 | srtKStrpyog_1_1 |
| 684 | srtRStrpyog_1_1 |
| 685 | srtTStrpyog_1_1 |
| 686 | vickKStrpyog_1_1 |
| 702 | hlyXStrmut_1_1 |
| 703 | igaStrmitis_1_1 |
| 704 | igaStrsanguis_1_1 |
| 705 | perMStrmut_1_1 |
| 750 | flaA_1_1 |
| 751 | flaD_1_1 |
| 752 | fliA_1_1 |
| 753 | hpmA_1_1 |
| 754 | hpmB_1_1 |
| 755 | lpsPrmi_1_1 |
| 756 | mrpA_1_1 |
| 757 | mrpB_1_1 |
| 758 | mrpC_1_1 |
| 759 | mrpD_1_1 |
| 760 | mrpE_1_1 |
| 761 | mrpF_1_1 |
| 762 | mrpG_1_1 |

| SEQ ID NO | Probe |
|-----------|--------------|
| 763 | mrpH_1_1 |
| 764 | mrpI_1_1 |
| 765 | mrpJ_1_1 |
| 766 | patA_1_1 |
| 767 | putA_1_1 |
| 768 | uca_1_1 |
| 769 | ureDPrmi_1_1 |
| 770 | ureEPrmi_1_1 |
| 771 | ureFPrmi_1_1 |
| 772 | zapA_1_1 |
| 773 | zapB_1_1 |
| 774 | zapD_1_1 |
| 775 | zapE_1_1 |
| 782 | end_1_1 |
| 783 | pqrA_1_1 |
| 784 | urg_1_1 |
| 2905 | sloStrep_1_1 |

c) resistance probes

| SEQ ID NO | Probe |
|-----------|--------------------|
| 785 | blaIMP-7_1_1 |
| 786 | mecISepid_1_1 |
| 787 | blaOXA-10_1_2 |
| 788 | blaB_1_1 |
| 789 | ampC_1_1 |
| 790 | I-blaR_1_1 |
| 791 | blaOXA-32_1_1 |
| 792 | bla-CTX-M-22_1_1 |
| 793 | pbp2aStrpneu_1_1 |
| 794 | blaSHV-1_1_1 |
| 795 | blaOXA-2_1_1 |
| 796 | blaRShaemolyt_1_1 |
| 797 | blaIMP-7_1_2 |
| 798 | I-mecR_1_1 |
| 799 | blaOXY_1_1 |
| 800 | dacCStrpyog_1_1 |
| 801 | femA_1_1 |
| 802 | mecA_1_1 |
| 803 | blaIShaemolyt_1_1 |
| 804 | blavim_1_1 |
| 805 | pbp2b_1_1 |
| 806 | pbp2primeSepid_1_1 |
| 807 | pbp2x_1_1 |
| 808 | pbp3Saureuc_1_1 |
| 809 | pbp4_1_1 |
| 810 | pbp5Efaecium_1_1 |
| 811 | pbpC_1_1 |
| 812 | I-mecI_1_1 |
| 813 | pbp1a_1_1 |
| 814 | I-blaI_1_1 |
| 815 | blaTEM-106_1_1 |

| SEQ ID NO | Probe |
|-----------|--------------------|
| 816 | blaOXY-KLOX_1_1 |
| 817 | ftsWEF_1_1 |
| 818 | fmhB_1_1 |
| 819 | cumA_1_1 |
| 820 | femBShaemolyt_1_1 |
| 821 | blaPER-1_1_1 |
| 822 | bla_FOX-3_1_1 |
| 823 | blaA_1_1 |
| 824 | psrb_1_1 |
| 825 | fmhA_1_1 |
| 826 | mecR1Sepid_1_1 |
| 827 | blaZ_1_1 |
| 828 | blaOXA-1_1_1 |
| 829 | fox-6_1_1 |
| 830 | blaPrmi_1_1 |
| 831 | aacA_aphDStwar_1_1 |
| 832 | aacC1_1_2 |
| 833 | aacC2_1_1 |
| 834 | strB_1_1 |
| 835 | aadA_1_1 |
| 836 | aadB_1_2 |
| 837 | aadD_1_1 |
| 838 | aacA4_1_2 |
| 839 | strA_1_1 |
| 840 | aph-A3_1_1 |
| 841 | aacC1_1_1 |
| 842 | aacA4_1_1 |
| 843 | aacA-aphD_1_1 |
| 844 | I-spc_1_1 |
| 845 | aphA3_1_1 |
| 846 | ermC_1_1 |
| 847 | linB_1_1 |
| 848 | satSA_1_1 |
| 849 | mdrSA_1_1 |
| 850 | I-linA_1_1 |
| 851 | ermB_1_2 |
| 852 | ermA_1_1 |
| 853 | satA_1_1 |
| 854 | msrA_1_1 |
| 855 | mphBM_1_1 |
| 856 | mefA_1_1 |
| 857 | mrX_1_1 |
| 858 | dfrStrpneu_1_1 |
| 859 | dfrA_1_1 |
| 860 | cmlA5_1_1 |
| 861 | catEfaecium_1_1 |
| 862 | cat_1_1 |
| 863 | tetAJ_1_1 |
| 864 | tetL_1_1 |
| 865 | tetM_1_1 |
| 866 | vanH(tn)_1_1 |
| 867 | vanA_1_1 |
| 868 | vanHB2_1_1 |

| SEQ ID NO | Probe |
|-----------|-----------------|
| 869 | vanR_1_1 |
| 870 | vanRB2_1_1 |
| 871 | vanS(tn)_1_1 |
| 872 | vanSB2_1_1 |
| 873 | vanWB2_1_1 |
| 874 | ddl_1_1 |
| 875 | ble_1_1 |
| 876 | vanXB2_1_1 |
| 877 | vanY(tn)_1_1 |
| 878 | vanYB2_1_1 |
| 879 | vanB_1_1 |
| 880 | vanZ(tn)_1_1 |
| 881 | vanC-2_1_1 |
| 882 | vanX(tn)_1_1 |
| 883 | acrB_1_1 |
| 884 | mexB_1_2 |
| 885 | I-qacA_1_1 |
| 886 | sulI_1_1 |
| 887 | sul_1_1 |
| 888 | cadBStalugd_1_1 |
| 889 | mexA_1_1 |
| 890 | acrR_1_1 |
| 891 | emeA_1_1 |
| 892 | acrA_1_1 |
| 893 | rtn_1_1 |
| 894 | abcXStrpmut_1_1 |
| 895 | qacEdelta1_1_1 |
| 896 | elkT-abcA_1_1 |
| 897 | I-cadA_1_1 |
| 898 | albA_1_1 |
| 899 | wzm_1_1 |
| 900 | msrCb_1_1 |
| 901 | nov_1_1 |
| 902 | wzt_1_1 |
| 903 | wbbI_1_1 |
| 904 | norA23_1_1 |
| 905 | mexR_1_1 |
| 906 | arr2_1_1 |
| 907 | mreA_1_1 |
| 908 | I-cadC_1_1 |
| 909 | uvrA_1_1 |
| 910 | CRD2_1_1 |
| 911 | CDR1_1_1 |
| 912 | CDR1_2_1 |
| 913 | MET3_1_1 |
| 914 | FET3_1_1 |
| 915 | FTR2_1_1 |
| 916 | MDR1-7_1_1 |
| 917 | ERG11_1_1 |
| 918 | SEC20_1_1 |
| 2864 | aacA4ENCL_1_1 |
| 2865 | AdeR-ACIBA_1_1 |
| 2866 | adeA-ACIBA_1_1 |

| SEQ ID NO | Probe |
|-----------|-----------------|
| 2867 | aac(6p)-lb7_1_1 |
| 2868 | adeB-ACIBA_1_1 |
| 2869 | adeC-ACIBA_1_1 |
| 2870 | AdeS-ACIBA_1_1 |
| 2871 | blaL2_1_1 |
| 2872 | blaMIR-3_1_1 |
| 2873 | ampR_1_1 |
| 2874 | ampC-ENCL_1_1 |
| 2875 | blaL1_1_1 |
| 2888 | sulII_1_1 |
| 2907 | tetA-ACIBA_1_1 |
| 2908 | tetR-ACIBA_1_1 |

d) controls and utility

| SEQ ID NO | Probe |
|-----------|-----------------------|
| 919 | rbcl_1_1 |
| 925 | rbcl_1_2 |
| 920 | LDHA(hu)_1_1 |
| 921 | GAPD(hu)_1_1 |
| 922 | b-Act(hu)_1_1 |
| 923 | ARHGDIA(hu)_1_1 |
| 924 | PGK1(hu)_1_1 |
| 926 | 16SPa_1_1 |
| 927 | 23SEfaecium_2_1 |
| 928 | 16SStrepyog_1_1 |
| 929 | 16SStreneu_1_1 |
| 930 | 16SSrepagalactiae_1_1 |
| 931 | 16SEfaecium_1_1 |
| 932 | 16SEfaecium_2_1 |
| 933 | 16SRNAEf_2_1 |
| 934 | 16SKpn_1_1 |
| 935 | 16SSa_3_1 |
| 936 | 16SRNAEf_1_1 |
| 937 | 16SShominis_1_1 |
| 938 | 16SShaemolyt_1_1 |
| 939 | 23SEfaecium_1_1 |
| 940 | 16SrRNAPrmi_1_1 |
| 941 | 16SrRNAPrvu1_1_1 |
| 942 | 16SSa_1_1 |
| 943 | 16SKlox_1_1 |
| 944 | p53_1_1 |
| 945 | 0135mihck_1_1 |
| 946 | FAN_1_1 |
| 947 | 0270cap_1_1 |
| 2842 | 16SStrepdysgal_1_1 |

The DNA microarray of (1) is preferably suitable for

- 5 (I) identification of *Staphylococcus aureus* and comprises one or more or all gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71,

74, 76, 77, 79, 2902 and 2903, preferably at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) identification of *Escherichia coli* and comprises one or more or all gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probes represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) identification of *Staphylococcus haemolyticus* and comprises one or more or all gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) identification of *Staphylococcus lugdunensis* and comprises one or more or all gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) identification of *Staphylococcus warneri* and comprises one or more or all gene probes selected from SEQ ID NO:224-228 and 230 preferably at least one of the gene probes represented by SEQ ID NO:224, 226 and 230; and/or

(VII) identification of *Staphylococcus saprophyticus* and comprises one or more or all gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) identification of *Staphylococcus hominis* and comprises one or more or all gene probes selected from SEQ ID NO:2096, 194 and 229 (do hybridise with *S. hominis* DNA) and 211 and 214 (do not hybridise with *S. hominis* DNA); and/or

(IX) identification of *Candida albicans* and comprises one or more or all gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) identification of *Enterococcus faecalis* and comprises one or more or all gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

(XI) identification of *Enterococcus faecium* and comprises one or more or all gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) identification of *Klebsiella pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

5 (XIII) identification of *Klebsiella oxytoca* and comprises one or more or all gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

(XIV) identification of *Pseudomonas aeruginosa* and comprises one or more or all gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at
10 least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) identification of *Streptococcus pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

15 (XVI) identification of *Streptococcus agalactiae* and comprises one or more or all gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO: 606 and 619; and/or

(XVII) identification of *Streptococcus pyogenes* and comprises one or more or all gene probes selected from SEQ ID NO:645-648, 652, 655, 656, 658 and 660,
20 preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) identification of *Streptococcus mutans* and comprises one or more or all gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

25 (XIX) identification of *Proteus mirabilis* and comprises one or more or all gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

(XX) identification of *Proteus vulgaris* and comprises one or more or all gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene
30 probes represented by SEQ ID NO:776, 777 and 781; and/or

(XXI) identification of *Acinetobacter baumannii* and comprises one or more or all gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

In a preferred aspect of present invention, the DNA microarray of embodiment (1) is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

In a second preferred aspect, the DNA microarray is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively. These microorganisms are the prevalent microorganisms in clinical samples and/or are of the highest diagnostic relevance. The probes listed under (a) to (h) are the most reliable probes for identification of said microorganisms.

From above second preferred aspect, there can be selected a set of probes which is even more preferred, namely SEQ ID NO:71, 2906, 145 and 249. A DNA microarray comprising one, several or all of said four probes is suitable for species specific detection or differentiation of

- (i) *S. aureus* if it comprises SEQ ID NO:71;
- (ii) CoNS if it comprises SEQ ID NO:2906;
- (iii) *E. coli* if it comprises SEQ ID NO:145; and/or
- (iv) *Candida albicans* if it comprises SEQ ID NO:249.

5 This set of four probes thus forms an especially preferred set of probes for embodiment (1).

There are some further sets of probes which are especially preferred for the DNA microarray of embodiment (1). Namely, there are a few DNA microarrays which form preferred aspects of embodiment (1). They are suitable for species-specific
 10 identification and differentiation of the following sets of microorganisms and therefore comprise at least the minimum number of probes which are necessary for the species specific identification:

- (A) *S. aureus*;
- (B) Staphylococci including *S. aureus* and CoNS;
- 15 (C) set (A) or (B) additionally including *E. coli*;
- (D) any of the sets of (A) to (C) additionally including *C. albicans*;
- (E) any of the sets of (A) to (D) additionally including *Enterococcus* sp.;
- (F) any of the sets of (A) to (E) additionally including *Proteus* sp. and/or *P. aeruginosa*.
- 20 Sets (B), (C) and (D) are preferred, set (D) is especially preferred.

In addition, the DNA microarray of embodiment (1) may be suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

- 25 In a further especially preferred aspect, the DNA microarray of (1) is suitable for
 - (I) virulence determination of *Staphylococcus aureus* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141; and/or
 - (II) virulence determination of *Escherichia coli* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173; and/or

- (III) virulence determination of *Staphylococcus epidermidis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208; and/or
- 5 (IV) virulence determination of *Staphylococcus haemolyticus* and comprises the gene probe of group (b) represented by SEQ ID NO:215; and/or
- (V) virulence determination of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:220-221; and/or
- 10 (VI) virulence determination of *Staphylococcus warneri* and comprises the gene probe of group (b) represented by SEQ ID NO:230; and/or
- (VII) virulence determination of *Candida albicans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:292-307; and/or
- (VIII) virulence determination of *Enterococcus faecalis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:343-376; and/or
- 15 (IX) virulence determination of *Enterococcus faecium* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:394-398; and/or
- (X) virulence determination of *Klebsiella pneumonia* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:432-448; and/or
- (XI) virulence determination of *Klebsiella oxytoca*; and/or
- 20 (XII) virulence determination of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:491-522; and/or
- (XIII) virulence determination of *Streptococcus pneumoniae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:592-605; and/or
- 25 (XIV) virulence determination of *Streptococcus agalactiae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:640-644; and/or
- (XV) virulence determination of *Streptococcus pyogenes* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:657-686; and/or
- 30 (XVI) virulence determination of *Streptococcus mutans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:702-705; and/or

(XVII) virulence determination of *Proteus mirabilis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:750-775; and/or

(XVIII) virulence determination of *Proteus vulgaris* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:782-784.

5 In a further especially preferred aspect, the DNA microarray of (1) is suitable for antibiotic resistance determination of (I) *Staphylococcus aureus*, (II) *Escherichia coli*, (III) *Staphylococcus epidermidis*, (IV) *Staphylococcus haemolyticus*, (V) *Staphylococcus lugdunensis*, (VI) *Staphylococcus warneri*, (VIII) *Enterococcus faecalis*, (IX) *Enterococcus faecium*, (X) *Klebsiella pneumonia*, (XI) *Klebsiella*
 10 *oxytoca*, (XII) *Pseudomonas aeruginosa*, (XIII) *Streptococcus pneumoniae*, (XIV) *Streptococcus agalactiae*, (XV) *Streptococcus pyogenes*, (XVI) *Streptococcus viridans*, (XVII) *Proteus mirabilis*, and/or (XVIII) *Proteus vulgaris* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909; 2864-2875, 2888, 2907-2908 and/or

15 it is suitable for antibiotic resistance determination of (VII) *Candida albicans* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:910-918.

In a preferred embodiment, the microarray of (1) is suitable for identification and characterisation, i.e. virulence and/or resistance determination, of the target
 20 microorganism and comprises one or more or all of the gene probes of group (a) and additionally one or more or all of the gene probes of group (b) and group (c) for each organism as listed above.

If the identification and/or characterisation of *S. aureus*, *E. coli* and/or *P. aeruginosa* is the aim of a test using the array, then the array comprises preferably
 25 at least the core gene probes designated in example 1.7, more preferably all the sequences listed in Tab. 2 and/or Tab. 6. Even more preferred, it consists of said sequences.

The gene probes were considered as most preferable if they were i) known previously to be species-specific, ii) bioinformatically selected to have the least
 30 chance to hybridise with nontarget genes and iii) empirically proven to be specific in a series of experiments (see Examples).

In a most especially preferred aspect, the DNA microarray of (1) comprises the following gene probes, even more preferably consists of the following gene probes:

(I) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus aureus*, it comprises

(a) the gene probes represented by SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903; and at least one of

5 (b) the gene probes represented by SEQ ID NO:100-141 and

(c) the gene probes represented by SEQ ID NO:785-909, 2864-2875, 2888, 2907, 2908.

(II) When the DNA microarray is suitable for identification and characterisation of *Escherichia coli*, it comprises

10 (a) the gene probes represented by SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170; and at least one of

(b) the gene probes represented by SEQ ID NO:153-173 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

15 (III) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus epidermidis*, it comprises

(a) the gene probes represented by SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199; and at least one of

(b) the gene probes represented by SEQ ID NO: 200-208 and

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

(IV) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus haemolyticus*, it comprises

25 (a) the gene probes represented by SEQ ID NO:211, 213 and 214; and at least one of

(b) the gene probes represented by SEQ ID NO: 215 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

30 (V) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus lugdunensis*, it comprises

(a) the gene probes represented by SEQ ID NO:216, 217 and 219-221; and at least one of

(b) the gene probes represented by SEQ ID NO: 220-221 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VI) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus warneri*, it comprises

5 (a) the gene probes represented by SEQ ID NO:224-228 and 230; and at least one of

(b) the gene probes represented by SEQ ID NO: 230 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

10 (VII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus saprophyticus*, it comprises

(a) the gene probes represented by SEQ ID NO:222 and 223; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (VIII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus hominis*, it comprises

(a) the gene probes represented by SEQ ID NO:2096, 194, 229, 211 and 214; and at least one of

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(IX) When the DNA microarray is suitable for identification and characterisation of *Candida albicans*, it comprises

(a) the gene probes represented by SEQ ID NO:231-291; and at least one of

(b) the gene probes represented by SEQ ID NO: 292-307 and

25 (c) the gene probes represented by SEQ ID NO: 910-918, 2864-2875 2888, 2907, 2908.

(X) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecalis*, it comprises

30 (a) the gene probes represented by SEQ ID NO:308-310 and 312-342; and at least one of

(b) the gene probes represented by SEQ ID NO: 343-376 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XI) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecium*, it comprises

(a) the gene probes represented by SEQ ID NO:377-393; and at least one of

(b) the gene probes represented by SEQ ID NO: 394-398 and

5 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella pneumonia*, it comprises

10 (a) the gene probes represented by SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431; and at least one of

(b) the gene probes represented by SEQ ID NO: 432-448 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (XIII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella oxytoca*, it comprises

(a) the gene probes represented by SEQ ID NO:459 and 466-469; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

20 (XIV) When the DNA microarray is suitable for identification and characterisation of *Pseudomonas aeruginosa*, it comprises

(a) the gene probes represented by SEQ ID NO:470-485, 487-493 and 505; and at least one of

(b) the gene probes represented by SEQ ID NO: 491-522 and

25 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XV) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pneumoniae*, it comprises

(a) the gene probes represented by SEQ ID NO:523-591; and at least one of

30 (b) the gene probes represented by SEQ ID NO: 592-605 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVI) When the DNA microarray is suitable for identification and characterisation of *Streptococcus agalactiae*, it comprises

- (a) the gene probes represented by SEQ ID NO:606-639; and at least one of
- (b) the gene probes represented by SEQ ID NO: 640-644 and
- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

5 (XVII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pyogenes*, it comprises

- (a) the gene probes represented by SEQ ID NO:645-648, 652, 655-656, 658 and 660; and at least one of
- (b) the gene probes represented by SEQ ID NO: 657-686 and

10 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVIII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus mutans*, it comprises

- (a) the gene probes represented by SEQ ID NO:687-701; and at least one of

15 (b) the gene probes represented by SEQ ID NO: 702-705 and

- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIX) When the DNA microarray is suitable for identification and characterisation of *Proteus mirabilis*, it comprises

20 (a) the gene probes represented by SEQ ID NO:706-710, 712-742 and 744-749; and at least one of

- (b) the gene probes represented by SEQ ID NO: 750-775 and

- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

25 (XX) When the DNA microarray is suitable for identification and characterisation of *Proteus vulgaris*, it comprises

- (a) the gene probes represented by SEQ ID NO:776-778 and 780-781; and at least one of

- (b) the gene probes represented by SEQ ID NO: 782-784 and

30 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XXI) When the DNA microarray is suitable for identification and characterisation of *Acinetobacter baumannii*, it comprises

- (a) the gene probes represented by SEQ ID NO:2843-2863; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

The DNA microarray which is a preferred aspect of embodiment (1) can be fabricated using textbook methods for microarray production, including printing with fine-pointed pins onto the solid support, photolithography using pre-made masks or dynamic micromirror devices, ink-jet printing or electrochemistry on microelectrode arrays (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays, Spektrum Akademischer Verlag, Heidelberg (2004)). Preferred fabrication methods are printing methods spotting the gene probes onto the solid surface of the microarray. The attachment of the spotted DNA to the surface is achieved by covalent or non-covalent binding, preferably by non-covalent binding, more preferably by electrostatic interaction (ionic binding), most preferably by ionic binding of the DNA to amino groups present on the surface of the solid support. Any amino-functionalized microarray support can be used, but gamma aminopropyl silane (GAPS™) coated slides, especially UltraGAPS™ coated glass slides, are preferred in present invention.

The amount of DNA per spot printed onto the array is from 0.1 to 15.0 ng, preferably from 0.1 to 0.2 ng.

Thus, the present invention also pertains to a method for fabrication of a microarray of embodiment (1), which method comprises spotting the gene probes listed above to an appropriate solid support.

The sample of embodiments (1) to (4) may be any sample containing microorganisms, including food samples, environmental samples and clinical specimens. A sample which is a clinical specimen is preferred. The sample or clinical specimen of embodiments (1) to (4) is preferably selected from the group consisting of whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, swabs, wound fluid and positive blood cultures, more preferably is whole blood or a positive blood culture, most preferably is a positive blood culture. If blood culture is used as DNA source, 0.5 ml positive blood culture is sufficient for identification and characterisation of the microorganisms and bacteria present without prior amplification of the target DNA.

Thus, the microarray of present application is

(i) a robust diagnostic tool, detecting all tested bacterial reference strains and clinical isolates;

(ii) sensitive enough to yield positive signals with e.g. only 20 ng of purified genomic *S. aureus* DNA or 2 µg of DNA extracted from blood culture which contains
5 a high percentage of human DNA;

(iii) highly specific, distinguishing e.g. *S. aureus* from distantly related gram-negative bacteria like *Escherichia coli* or *Pseudomonas aeruginosa* as well as from closely related CoNS;

(iv) precise enough to identify virulence factors and antibiotic resistance
10 determinant genes without previous amplification by PCR.

Moreover, the whole procedure can be accomplished the same day after blood cultures become positive (e.g. in the Bactec®). Rapid identification of the causative pathogen in fungemia, bacteremia and sepsis is crucial for several reasons:

(i) appropriate antimicrobial therapy should be started as early as possible and
15 unnecessary treatment avoided;

(ii) the prognosis of the patients with sepsis may be improved; and

(iii) expenditures on antimicrobials and prolonged hospitalisation can be reduced.

The DNA microarray of embodiment (1) is especially suitable for diagnosis of

(i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes
20 for species specific identification of at least *S. aureus*, *E. coli*, CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*; and/or

(iii) urinary tract infections, wherein the device preferably comprises probes for
25 species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

With the gene-segment based microarray of (1) there is an excellent correlation
30 between genotypic detection of antibiotic resistance determinants and phenotypic typing using conventional susceptibility testing. In one aspect of the invention, the detection of the resistance genes *mecA*, *blaZ*, *ermA*, *ermC*, *msrSA*, *aadD* and *aacA-aphD* by microarray hybridisation allows for reliable prediction of oxacillin, penicillin, erythromycin, tobramycin and gentamicin resistance in a single assay.

By microarray hybridisation according to present invention it is furthermore possible to discriminate multi-resistant and multi-susceptible MRSA (strain MW2). Multi-susceptible MRSA have been shown to be susceptible to tobramycin and erythromycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001);
5 Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

In a preferred aspect of the invention, simultaneous comprehensive resistance genotyping for oxacillin, macrolide and aminoglycoside resistance genes (preferably *mecA*, *aadD*, *aacA-aphD*, *ermA,B,C* and *msrSA*) by microarray hybridisation allows the rapid discrimination of multi-resistant or multi-susceptible strains and in
10 consequence other therapeutic options with e.g. macrolides and may reduce reliance on vancomycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001); Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

One preferred aspect of embodiment (1) is a DNA microarray for the identification and characterisation of the three important bacteremia causing species
15 *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* in a sample, preferably in blood culture. The microarray allows simultaneous species identification and detection of important virulence and antibiotic resistance genes in a single assay. Preferably, this array consists of 2-20 species specific gene probes, 1-20 virulence gene probes and 1-20 resistance gene probes of at least 100 nt
20 length, more preferably of 200-800 nt length. One especially preferred embodiment is an array comprising or consisting of the gene probes listed in Tab. 2. The probes may be amplified from recombinant plasmids or synthesized by any other method known in the art. These probes represent genes encoding house-keeping proteins, virulence factors and antibiotic resistance determinants. Evaluation with 42 clinical
25 isolates, 3 reference strains and 13 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus*, *E. coli* and *P. aeruginosa* strains and in discriminating them from closely related Gram-positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia. In Example 1.6 and 1.7, this array was successful in identifying all tested 27 *E. coli*, *P.*
30 *aeruginosa* and *S. aureus* strains and in discriminating them from 21 closely related Gram positive and Gram negative bacterial strains. There is a nearly perfect correlation between genotypic antibiotic resistance by hybridisation to the *S. aureus* resistance gene probes *mecA* (oxacillin/methicillin resistance), *aacA-aphD*

(gentamicin resistance), *ermA* (erythromycin resistance) and *blaZ* (penicillin resistance) and the *E. coli* resistance gene probes *blaTEM-106* (penicillin resistance) and *aacC2* (aminoglycoside resistance) and phenotypic antibiotic resistance determined by conventional susceptibility testing (Example 1.10).

- 5 One further preferred aspect of embodiment (1) of the invention is a DNA microarray for the identification and characterisation of *S. aureus* in a sample, preferably in blood culture. Evaluation with 10 clinical isolates, 6 reference strains and 10 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus* and in discriminating them from closely related Gram-
10 positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia (Example 1.11).

The DNA microarray is - in the context of embodiment (2) - preferably used for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain(s)
15 contained in a mixture of a plurality of microorganisms. The DNA microarray of embodiment (1) is advantageous for this kind of use, as it allows the simultaneous determination of the presence or absence in the analysed sample of all those microbial strains for which the device comprises species specific probes. The array is also suitable for identification and determination of single or of a selection of
20 microbial strains in a mixture of strains, especially in a clinical sample containing additional component, without prior isolation of the target strain. These advantages (simultaneous determination and applicability to clinical samples and mixtures) make the DNA microarray of embodiment (1) superior to conventional techniques of DNA amplification for identification of microbial strains like PCR.

- 25 The method of embodiment (3) comprises - after isolating the total DNA (including non-microbial DNA) from a sample - the steps of immediate labelling and microarray-based detection of this isolated DNA with or without, preferably without, further DNA amplification steps after the DNA isolation. It is one advantage of the method (3) that it can be performed without said further DNA amplification steps,
30 i.e. the isolated DNA is labelled and applied to the microarray without prior amplification. The use of a single protocol for all microbial species comprising all steps of a microarray procedure including DNA preparation and DNA-chip hybridisation, is essential for testing blood cultures or other clinical specimens,

where the bacterial diagnosis is usually uncertain. Preferably, a DNA preparation protocol employing sonication for simultaneous cell disruption and target DNA fragmentation is the method of choice to increase the sensitivity of the microarray, in particular towards low-copy number and/or plasmid encoded genes which may
5 be underrepresented in the target DNA.

The method of embodiment (3) is preferably a method for diagnosis of bacteremia, fungemia or sepsis. Furthermore, the sample or clinical specimen used in embodiment (3) is preferably blood or derived from blood, more preferably is a blood culture. Most preferably, the clinical specimen is a positive blood culture.

10 To obtain positive signals in the method of embodiment (3), 100 pg of purified genomic microbial DNA may be sufficient (lower detection limit), but preferably at least 1 ng of said DNA should be present in the sample. Usually, at least 10 ng, preferably at least 20 ng, more preferably at least 1 µg of purified genomic microbial DNA or at least 1 µg, preferably at least 2 µg of DNA extracted from blood
15 culture are required. 500 µl of positive blood culture yield enough DNA for several hybridisations.

In a preferred aspect of the method of embodiment (3), the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming. In a further preferred aspect, the DNA
20 isolated in step (a) is fragmented before the labelling reaction. Both aspects simplify and speed up the analysis in comparison to convention methods.

In the method of embodiment (3), the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than or equal to 100 %, preferably is from 1% to 99%, more preferably from 30 to 60%.

25 The labelling reaction of the method of embodiment (3) may be any DNA labelling reaction known in the art. However, chemical labelling reactions consisting of chemical attachment of a reporter molecule to the sample DNA and labelling by integration of labelled nucleotides into the sample DNA are preferred. Preferably the reporter molecules are fluorophores, more preferably are of the cyanine group of
30 fluorophores. Most preferably, the DNA is labelled with Cy3, Cy5 and/or Alexa Fluor 647 and Alexa Fluor 546. The ratio of bases to dye molecules (BDR) is preferably less or equal to 60.

The detection of the reporter molecule in the method of embodiment (3) of the invention is preferably done by using a suitable detection system for the bound reporter molecule. This detection system is preferably based on visualization of the reporter molecule, more preferably on fluorescence detection. Furthermore, the detection is preferably done by a microarray scanner or microarray reader.

In the method of embodiment (3) of the invention, the DNA microarray can be substituted by any other solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes the use of microtiter plates coated with one or several DNA gene probes per well, of glass surfaces (like, e.g., microscopic slides) with DNA spots, of filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads are preferably used in a multi-chamber system, more preferably in a microfluidic multi-chamber system, wherein each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Complimentary, beads made of a magnetic material could be attached to an iron surface.

The use of the DNA coated beads or of a DNA microarray of embodiment (1) is preferred. The use of a DNA array is especially preferred.

Thus, in one preferred aspect, in the method of embodiment (3) the analytical device is a DNA microarray. In this case, the detection is preferably performed using a DNA microarray reader. In a second preferred aspect, the analytical device is a DNA coated bead or a set of DNA coated beads (plurality of DNA coated beads). In this case, the application and/or detection step is preferably performed in a microfluidic device.

The kit of embodiment (4) of the invention may additionally comprise reagents for the labelling reactions of embodiment (3) and/or reagents necessary for the hybridisation step of the method of embodiment (3).

5 The present invention is described in more detail by reference to the following examples. It should be understood that these examples are for illustrative purpose only and are not to be construed as limiting the invention.

Examples

10 In the experimental examples described below, standard techniques of recombinant DNA technology were used that were described in various publications, e.g. Sambrook et al. (1989), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, or Ausubel et al. (1987), Current Protocols in Molecular Biology 1987-1988, Wiley Interscience. Unless otherwise indicated, all enzymes and kits were used according to the manufacturers' specifications.

Example 1.1: Materials and Methods

15 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, Herndon, Virginia). Clinical isolates were obtained
20 from the inventors' clinical routine microbiology laboratory.

The following bacteria were used for evaluation of the specificity of the microarray in Examples 1.2-1.10: *Staphylococcus aureus* (ATCC 25923, NRS123 alias MW2, 5 clinical isolates), *Staphylococcus epidermidis* (5 clinical isolates), *Staphylococcus capitis* (clinical isolate), *Staphylococcus haemolyticus* (clinical isolate),
25 *Staphylococcus hominis* (clinical isolate), *Staphylococcus warneri* (clinical isolate), *Staphylococcus auricularis* (clinical isolate), *Micrococcus* spp. (clinical isolate), *Escherichia coli* (ATCC 25922, 6 clinical isolates), *Pseudomonas aeruginosa* (ATCC27853, 5 clinical isolates), *Klebsiella pneumoniae* (3 clinical isolates), *Proteus mirabilis* (2 clinical isolates), *Serratia marcescens* (2 clinical isolates), *Enterobacter cloacae* (clinical isolate), *Enterobacter aerogenes* (clinical isolate), *Acinetobacter baumannii* (clinical isolate), *Stenotrophomonas maltophilia* (clinical isolate),
30 *Enterococcus* spp. (clinical isolate), *Enterococcus faecalis* (clinical isolate) and

Streptococcus pneumoniae (clinical isolate). Bacterial strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth (TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Blood cultures: Aerobic and anaerobic blood culture bottles (BACTEC®, Becton Dickinson, Heidelberg, Germany) were inoculated with blood from patients with suspected sepsis and placed in a BACTEC® 9240 blood culture system (Becton Dickinson), a continuous-reading, automated, and computed blood culture system that detects the growth of microorganisms by monitoring CO₂ production. Incubation was performed according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and aliquots of 1 ml of the blood culture suspensions were taken aseptically with a needle syringe. 1 ml-aliquots of the blood culture suspensions were mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt human blood cells. Bacterial cells were then harvested at 17,900 g for 10 min, pellets were washed in 1 ml TE, recovered by centrifugation and used for DNA preparation. For conventional identification and susceptibility testing, a second 1 ml-aliquot was examined by Gram-stain and subcultured on agar plates. The organisms grown on agar plates were characterised and tested for susceptibility using a VITEK-2 system (bioMérieux, Inc., Nürtingen, Germany), Etest strips (AB BIODISK, Solna, Sweden) or disk diffusion tests following the method recommended by the National Committee for Clinical Laboratory Standards (NCCLS) (Standards, N.C.f.C.L., Approved standard M2-4a, Villanova, PA (1990)).

For microarray hybridisation experiments, DNA was prepared from 13 blood cultures positive for *S. aureus* (4), *S. epidermidis* (3), *S. pneumoniae* (2), *P. aeruginosa* (1), *E. coli* (2) and *P. mirabilis* (1).

Example 1.2: DNA preparation

Total cellular DNA was extracted and purified either by using the First-DNA All-tissue kit (GEN-IAL GmbH, Troisdorf, Germany) following the instructions of the

supplier or by enzymatic lysis followed by phenol/chloroform extraction. For the latter protocol, cell pellets were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0, 2 mM EDTA, pH 8.0, and 1.2% Triton®-X-100) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 0.8 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, cell lysates were treated with Proteinase K (1 mg/ml; Sigma) for 1 hour at 55°C and then with RNase A (0.2 mg/ml; Qiagen, Hilden, Germany) for 1 hour at 37°C. The volume was increased by the addition of 200 µl TE and the salt concentration was adjusted to 0.7 M by addition of 5 M NaCl. A 10% CTAB (cetyltrimethylammonium bromide) solution in 0.7 M NaCl was added to a final concentration of 1% and incubated at 65°C for 20 min in order to release DNA from polysaccharide DNA complexes. DNA was then extracted once with phenol/chloroform/isoamyl alcohol (25:24:1) and once with chloroform/isoamyl alcohol (24:1) prior to precipitation with one volume of isopropanol. After centrifugation at 17,900 g for 30 min, DNA pellets were washed in 70% ethanol and resuspended in 50-100 µl TE.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 1.3: DNA labelling

Total DNA from commercially available reference strains, clinical isolates and blood cultures was labelled by a non-enzymatic chemical labelling method using the Label It Cy3/Cy5 kits (Mirus, Madison, USA) or the ULYSIS Alexa Fluor 467 Nucleic Acid Labelling Kit (Molecular Probes; Eugene, USA). Prior to labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls.

For labelling with the Label It Cy3/Cy5 kit 5 µg of high molecular weight DNA (>20 kb) were mixed with 7.5 µl reagent in a total volume of 50 µl and incubated for 2 hours at 37°C according to the recommendations by the supplier. After adjusting the volume to 200 µl with H₂O and adding 0.1 volume of 5 M NaCl, unbound label was removed by precipitation with 2 volumes of ice-cold absolute ethanol for at least 30 min at -20°C. The labelled DNA was recovered by centrifugation at 17,900

g for 30 min. The pellet was washed with 70% ethanol and resuspended in 70 µl TE.

For labelling with the Ulysis Alexa Fluor 647 kit, 1 µg DNA was denatured at 95°C for 5 min, cooled on ice, mixed with 20 µl labelling buffer and 5 µl reagent and incubated at 80°C for 15 min according to the instructions of the manufacturer. Unbound dye was removed by ethanol precipitation as described above. The relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 1.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All together 120 gene segments representing virulence genes, antibiotic resistant determinants and species specific metabolic and structural genes from *S. aureus* (40), *E. coli* (31) and *P. aeruginosa* (49) were represented on the microarray (Tab. 2).

Tab. 2: Gene probes with SEQ ID NOs, function, gi numbers and primer sequences. *E. coli* gene probes (1-31), *P. aeruginosa* gene probes (32-80), *S. aureus* gene probes (81-120).

| Ar-ray No. | Sym-bol | Function | gi number | gene probe SEQ ID NO | Primer forward [SEQ ID NO] | Primer reverse [SEQ ID NO] |
|------------|---------------|-------------------------------------|-----------|----------------------|------------------------------|----------------------------|
| 1 | <i>envZ</i> | Inner membrane osmosensor | 453286 | 143 | AGCCTGGTGACGA CTTATC [1233] | ATCCGCCAGTTGCTT AAC [1234] |
| 2 | <i>fes(2)</i> | Enterochelin esterase (siderophore) | 145916 | 161 | TGTTTCTGCACTCG AAATG [1269] | GGCAATAGCTTTCAC CAG [1270] |
| 3 | <i>fes(1)</i> | Enterochelin esterase (siderophore) | 145916 | 160 | TGTTTGAGGTCAC TTTCTGG [1267] | CAATAGCTTTCACCA GGG [1268] |

| | | | | | | |
|----|--------------|--|----------|-----|---------------------------------|------------------------------|
| 4 | <i>nfrB</i> | Bacteriophage N4 receptor, inner membrane protein | 16127994 | 145 | ATGGAATTGCGTCTGTTC [1237] | AAGTTTAGCCACAGCAGG [1238] |
| 5 | <i>yachH</i> | Putative membrane protein | 16127994 | 148 | GACTCGGTACAGCGATTG [1242] | CTGACGTTGGGTATCTCG [1243] |
| 6 | <i>yagX</i> | Putative enzyme | 16127994 | 149 | CTTTACGACGGTTCTCCC [1244] | AATCTTCCCTGCTGAATG [1245] |
| 7 | <i>ycdS</i> | Putative outer membrane protein | 16127994 | 150 | TTGAACTTCTTAC TGCCG [1246] | AATTTCTAATGCAGCGTATTG [1247] |
| 8 | <i>b1169</i> | | 16127994 | 142 | GTTTGGGACTTATTGCTCTG [1230] | CATCAGCCACAGTTTCAAG [1231] |
| 9 | <i>b1202</i> | Putative outer membrane protein | 16127994 | 153 | GAATACCAAAGCAGATCGTC [1252] | CCGAGATCGACAACAGAG [1253] |
| 10 | <i>fliCb</i> | Flagellar H antigen | 8071787 | 144 | ACCACGACAGGTC TTTATG [1234] | AGAGAGGCACCGTC ACTAC [1235] |
| 11 | <i>iucA</i> | Aerobactin synthesis (siderophore) | 474189 | 165 | CATCAGGCAGTTATCCTGTC [1276] | AGTCGTCCTCCTGCA TTAC [1277] |
| 12 | <i>iucB</i> | Aerobactin synthesis (siderophore) | 474189 | 166 | TTCACAGCGGATATGGAC [1278] | CAC TTTGCTCCCAGAAATAC [1279] |
| 13 | <i>iucC</i> | Aerobactin synthesis (siderophore) | 474189 | 167 | AGACTGGGATTTGTGTC AAC [1280] | AGACACCATCCTGCC TTC [1281] |
| 14 | <i>papG</i> | Adhesin, P-pili protein | 42307 | 168 | GGAGTATATTGCGTGGGTAG [1282] | AAGATTACCATAGAGGCG [1283] |
| 15 | <i>yciQ</i> | Putative membrane protein | 16127994 | 151 | ATAGCAGGGCTGT TTGTATC [1248] | GACACGGAAACCAATTAAC [1249] |
| 16 | <i>ymcA</i> | Hypothetical protein | 16127994 | 152 | TATTGTCATCGCGCAGAG [1250] | TGTTGGGTTGAAAGAGTAGC [1251] |
| 17 | <i>eae</i> | Genetic locus necessary for the production of attaching and effacing lesions on tissue culture, OM protein adhesin | 145852 | 154 | CTAACTCATTGTGGTGGAGC [1254] | CTTGTCATCGGTCATGTTG [1255] |
| 18 | <i>eltB</i> | Enterotoxin subunit B | 145830 | 155 | GGCGTTACTATCCTCTCTATG [1256] | TTTCATACTGATTGCCG [1257] |
| 19 | <i>escR</i> | Secretion | 2897961 | 156 | TTTGTTGTTATTGGTACTTCATTC [1258] | ATCGAAATTGTTACTGGCG [1259] |
| 20 | <i>escT</i> | Secretion | 2897961 | 157 | TTACGCTTCCGATC ATAGTAG [1260] | GAATACGTTTAGTTGAGGCG [1261] |
| 21 | <i>escU</i> | Secretion | 2897961 | 158 | AAGTGAAGAGGTAATGGCTG [1262] | TACCATCAGTATCCTTGGC [1263] |

| | | | | | | |
|----|-------------------|---|----------|-----|----------------------------------|------------------------------------|
| 22 | <i>espB</i> | Protein secreted by enteropathogenic <i>E. coli</i> | 1657262 | 159 | GATGGTGACTCTAT TGCAGG [1264] | CCATACGATTCTGGA CCTC [1265] |
| 23 | <i>hlyA</i> | Enterohemorrhagic <i>Escherichia coli</i> hemolysin | 525328 | 163 | CTTGGAATGTTGG TAAAGC [1272] | TAAACTCCTTCGGTT GAGC [1273] |
| 24 | <i>hlyB</i> | Enterohemorrhagic <i>Escherichia coli</i> hemolysin | 1247757 | 164 | TCAATGCTGAAACT ATAAGGC [1274] | ACTTAGCACCCAGTT CGAC [1275] |
| 25 | <i>SLTII</i> | Shiga-like toxin type II | 304950 | 171 | TTCTTCGGTATCCT ATTCCC [1288] | TGTGAGGTCCACTTC TTCC [1289] |
| 26 | <i>toxALTPA</i> | Subunit A of heat-labile enterotoxin | 148027 | 172 | AAATGGCGACAAAT TATACC [1290] | CTGGGTCTCCTCATT ACAAG [1291] |
| 27 | <i>VT2vaB</i> | Verotoxin-2 variant, beta-subunit, shiga-like toxin | 148261 | 173 | AAGAAGATGTTTAT GGCGG [1292] | GATTCACAGGTA CTG GATT TG [1293] |
| 28 | <i>aacC2</i> | aminoglycoside-(3)-N-acetyltransferase | 45769 | 833 | GACCGATCACCTA CGAG [2612] | CGAAATGCTTCTCAA GATAGG [2613] |
| 29 | <i>blaTEM-106</i> | Class A beta-lactamase | 21464484 | 815 | ACATCGAACTGGAT CTCAAC [2576] | TCTCAGCGATCTGTC TATTTTC [2577] |
| 30 | <i>strB</i> | Streptomycin resistance protein B | 17129524 | 834 | AAGTTTCATTGCCA GACG [2614] | TAGACTGCGTTGCTC CTC [2615] |
| 31 | <i>sul</i> | Dihydropteroate synthase, sulfonamide resistance | 17129524 | 887 | CATCGTCAACATAA CCTCG [2720] | AATTCTTGCGGTTTC TTTC [2721] |
| 32 | <i>algB</i> | Alginate biosynthesis (exopolysaccharide) | 150990 | 494 | CACTTTCCGTTATT GCCTC [1934] | GAGGATGAGGATGT TGGC [1935] |
| 33 | <i>algN</i> | Alginate biosynthesis (exopolysaccharide) | 150999 | 495 | GACTGGCTGAATC GTCTC [1936] | GCAGGTCGTACCAG GAAG [1937] |
| 34 | <i>algR</i> | Alginate biosynthesis (exopolysaccharide) | 151003 | 496 | ATTGTCGATGACGA ACCTC [1938] | TTCAGGTAGAGCTG GAAATG [1939] |
| 35 | <i>aprA</i> | Alkaline protease | 45279 | 491 | CATTGAAAGGTCGT AGCG [1928] | CGACGAAGTGGATA TTGG [1929] |
| 36 | <i>aprE</i> | Alkaline protease secretion | 45279 | 492 | GGTCAAGCACATC CTAGTG [1930] | ACTTCCTTGCGGTAC TCC [1931] |

| | | | | | | |
|----|---------------|---|----------|-----|---------------------------------|---------------------------------|
| 37 | <i>glpR</i> | Repression of glycerol metabolic enzymes (glp=glycerol-3-phosphate) | 1399486 | 470 | CAAGCACAACAAG AAATACG [1886] | TAGACCTCCGAAGA GTTGC [1887] |
| 38 | <i>lasRa</i> | Elastase, virulence protein | 309873 | 499 | CTGGGACGTTAGT GTCATC [1944] | GTCTTGGCATTGAGT TCG [1945] |
| 39 | <i>lasRb</i> | Transcriptional activator of elastase | 151325 | 471 | GAGCGACCTTGGA TTCTC [1888] | ATAAGACCCAAATTA ACGGC [1889] |
| 40 | <i>lipA</i> | Extracellular triacylglycerol lipase | 45340 | 500 | AAGAAGTCTCTGCT CCCC [1946] | ACGATTTCTCCACC TGT [1947] |
| 41 | <i>lipH</i> | Lipophilic protein necessary for the expression of active lipase | 483463 | 501 | ATGGCAGTTTCAGT GTCG [1948] | CGAAATAGTCGTCCA GCC [1949] |
| 42 | <i>mexA</i> | Multidrug resistance protein MexA precursor | 5616092 | 889 | CTCGACCCGATCTA CGTC [2724] | GTCTTCACCTCGACA CCC [2725] |
| 43 | <i>Orf252</i> | DnaJ-like protein | 4545242 | 503 | GACCTGCTGTTCCA GTTG [1952] | AATTCACGGGTTTTTC TCG [1953] |
| 44 | <i>OrfX</i> | Regulatory protein, glycerol metabolism | 1399486 | 472 | ATGGATGCTCGGG TACTG [1890] | CTCAGCTACAGCCAC GAC [1891] |
| 45 | <i>pa0260</i> | Hypothetical protein | 15595198 | 473 | GATCGTCTCTGCCC AGTC [1892] | ACATTGATGGTGTCG TCC [1893] |
| 46 | <i>pa0572</i> | Hypothetical protein | 15595198 | 474 | AGGAGAGAACATG AGTCGC [1894] | TCCTTGTCCAGTAG TTACC [1895] |
| 47 | <i>pa1046</i> | Hypothetical protein | 15595198 | 477 | AGGCATCCATCGA GCTAC [1900] | AACGTCCGAGCAGG ATAC [1901] |
| 48 | <i>pa1069</i> | Hypothetical protein | 15595198 | 478 | GCGAGGAGGTATT CGACA [1902] | CCCTTCTGCGAGTAG TGTT [1903] |
| 49 | <i>pa1846</i> | Hypothetical protein | 15595198 | 479 | AAGGACTTCTGGTC GGTG [1904] | CAGGAACAGGTGCT CGTAG [1905] |
| 50 | <i>pa4082</i> | Hypothetical protein | 15595198 | 481 | CGAGCACCAATATC GAAC [1908] | GAGCCGTAGGTGTT ATCG [1909] |
| 51 | <i>pchG</i> | Necessary for formation of siderophore pyochelin | 4325021 | 504 | CCTGCTCAACACCT TCTATC [1954] | GTCGAACAACGCGA ACAG [1955] |
| 52 | <i>PhzA</i> | Phenazine biosynthesis proteins (low molecular weight toxins) | 5616088 | 505 | GTTGAAAGGGTTTA CCGAC [1956] | AATTTCTGCATCGGG TTC [1957] |

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|----|---------------|---|----------|-----|---------------------------------|---------------------------------|
| 53 | <i>PLC</i> | Phospholipase C (heat labile-hemolysin) | 151492 | 507 | GACTTCGCTGTTTCG ACTTC [1960] | TCGGTTCGAGTTCAT AGC [1961] |
| 54 | <i>plcN</i> | Non-hemolytic phospholipase C | 151497 | 508 | GTGTTCCAGGTGTT CGAC [1962] | GATAGACGTTGTCCT TGACC [1963] |
| 55 | <i>plcR</i> | Phospholipase C regulation | 151499 | 509 | ACAACCTGGAACA GCAACT [1964] | CGACTCTTGCGCGTA TTC [1965] |
| 56 | <i>PstP</i> | Phosphoenolpyruvate-protein phosphotransferase | 4545246 | 485 | GAAGTGAAGTCCG CCAAG [1916] | TCGAGCATCATCAGG TAGAC [1917] |
| 57 | <i>purK</i> | AIR carboxylase II, purine biosynthesis | 1621599 | 486 | TCGAGAAGTCGAT GTTCAAG [1918] | CTTGCCGTAGTGATG CAG [1919] |
| 58 | <i>rhIA</i> | Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis | 452502 | 518 | AGTCTGTTGGTATC GGTTTG [1982] | CTCCAGGTCGAGGA AATG [1983] |
| 59 | <i>rhIR</i> | Rhamnolipid regulation | 1117916 | 520 | TTCGATTACTACGC CTATGG [1986] | GGTCCATTGCAGGAT CTC [1987] |
| 60 | <i>toxA</i> | Exotoxin A precursor | 15595198 | 522 | GTGCGCTACAGCT ACACG [1990] | CTTGCCCTTCCCAGGT ATC [1991] |
| 61 | <i>uvrDII</i> | DNA helicase II UvrD | 3249556 | 487 | AGACCTACAACAAG GTTTCG [1920] | TGAGGATAGTCCCTT CGC [1921] |
| 62 | <i>vsmI</i> | Autoinducer synthesis protein | 695153 | 488 | ATTCTCTCTGAAT CGCTG [1922] | AATATCTTCATCGCC AGTTG [1923] |
| 63 | <i>xcpX</i> | Secretion protein, translocation of exoproteins across outer membrane | 45433 | 490 | TTCAACCTCAACGG ACTG [1926] | TGCAAGGTACTCACC AGC [1927] |
| 64 | <i>ExoS</i> | Exoenzyme S, secreted toxin | 13892017 | 497 | CGTTTGGGACAGA TTGAG [1940] | GATACTCTGCTGACC TCGC [1941] |
| 65 | <i>fpvA</i> | Ferripyoverdine receptor | 1633044 | 498 | AATGCGATAACCAT CAGC [1942] | CCGTCGTAAGTGGAA GTTG [1943] |
| 66 | <i>pa0625</i> | Hypothetical protein | 15595198 | 475 | AGGAGCAACTGAA GCGAC [1896] | TCTGCCTTTACCCAG GAC [1897] |
| 67 | <i>pa0636</i> | Hypothetical protein | 15595198 | 476 | AAGGTTGGCAGGA TCAAC [1898] | CTAGTGGCGAAATTG AACAG [1899] |
| 68 | <i>pa3866</i> | Hypothetical protein | 15595198 | 480 | TTCCCTAACGAATG CTGTC [1906] | CGTTGCTCCCTCATA CAC [1907] |
| 69 | <i>PhzB</i> | Phenazine biosynthesis proteins (low molecular weight toxins) | 5616088 | 506 | ATGCTCGATAATGC TATTCC [1958] | TTCTCGTAGTAACCC TCGG [1959] |

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|----|--------------------|---|----------|-----|---|----------------------------------|
| 70 | <i>pilAp</i> | Type IV pilin, involved in twitching motility and attachment | 18535593 | 482 | GCTTTACCTTGATC GAACTG [1910] | TCAATAGAGCCAGTC ACACC [1911] |
| 71 | <i>PilAp2</i> | type IV pilin, involved in twitching motility and attachment | 21629637 | 483 | TGCCGTGAGTGAA ATCAG [1912] | CGTAGTTGGCTTTCC AGTT [1913] |
| 72 | <i>pilC</i> | Pilin biogenesis protein | 18535591 | 484 | GGTATCAACCCACT AAAGGTC [1914] | GTCCAGAGCTTCTAC CAGAG [1915] |
| 73 | <i>pvdD</i> | Pyoverdine synthetase D (siderophore) | 1633044 | 510 | GTCAAGGGTGTTG TCTGC [1966] | CTCTGCACAACTCA GGG [1967] |
| 74 | <i>pyocin S1</i> | PyocinS1, bacteriocin | 286179 | 512 | CTTCAGTTCCGAGA TGCC [1970] | GTAACGAACGCTATC GGG [1971] |
| 75 | <i>pyocin S1im</i> | Immunity protein of pyocin S1 | 286179 | 513 | ATATACGGAAAAAG AGTTTCTTGAG [1972] | AGCACGCCATTCTTT AACTTC [1973] |
| 76 | <i>pyocin S2</i> | PyocinS2 | 286182 | 514 | TATACGGCTTCAGA CTTTCC [1974] | TGGCATAAGTATTGG CAG [1975] |
| 77 | <i>pys2(1)</i> | PyocinS2 | 15595198 | 515 | TCGCCAATAAGAAG AAATTG [1976] | AGTGGTACTCGAAG GGTTCT [1977] |
| 78 | <i>pys2(2)</i> | PyocinS2 | 15595198 | 516 | ATCCAGTATATTCC TGCTCG [1978] | TGCAATTTCTTCTTAT TGGC [1979] |
| 79 | <i>rbf303</i> | B-band LPS (O-antigen) biosynthesis | 836903 | 517 | ATCGTTCTGGTCTT CCTTG [1980] | ACCAAAGAGTGTTGA TAGCC [1981] |
| 80 | <i>rhIB</i> | Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis | 452502 | 519 | AACGCTTTCTCGAT CAGG [1984] | GATACTGTGCGGTTG TGA [1985] |
| 81 | <i>femA</i> | Factor essential for methicillin resistance | 4929298 | 801 | TACAGTCATTTAC GCAAAC [2548] | TCACGCTCTTCATT AGTTCT [2549] |
| 82 | <i>fmhA</i> | Factor essential for methicillin resistance | 4574232 | 825 | TGACTTCGGATGA GTTCAAT [2596] | GCTGTTAATTGTTGT TGCTTT [2597] |
| 83 | <i>fmhB</i> | Factor essential for methicillin resistance, putative | 4574234 | 818 | CTCACCCAAATGGA GATTTA [2582] | CTTGCTTTTCAGATG TTTCC [2583] |
| 84 | <i>gyrA</i> | DNA gyrase subunit A | 296393 | 60 | AGGCTCGTATGATT GAAAAA [1066] | GGTTTTGAGCACGAT ATGTAG [1067] |
| 85 | <i>gyrB</i> | DNA gyrase subunit B | 296393 | 61 | TTGGCACAACGAT AAGACA [1068] | AAAAATCGTTCAAAG TGCTC [1069] |

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|-----|------------------|--|----------|-----|---|--|
| 86 | <i>hemB</i> | Porphobilinogen synthase | 2589180 | 62 | ATCATCAGCGACAA TGAGAG [1070] | TTTTTAACATCTCGA ACTATATCTAA [1071] |
| 87 | <i>hemN</i> | Oxygen-independent coproporphyrinogen oxidase | 14349226 | 65 | TCTTCCATTCTCTC AGTCAA [1076] | AGACCATGTATGTAG GTGGC [1077] |
| 88 | <i>hla</i> | α -Hemolysin | 46763 | 120 | GTCAGCTCAGTAAC AACAAAC [1186] | GTAGCGAAGTCTGG TGAAAA [1187] |
| 89 | <i>lip</i> | Lipase | 393265 | 68 | TGCATCTTCCATTT TAATAGC [1082] | GTCATTGTCCTTTGT TGGTT [1083] |
| 90 | <i>menC</i> | o-Succinylbenzoic acid synthetase | 1255258 | 69 | TTGACAGCTTTGCA TTTTTA [1084] | GGCTTTGTTGCTTTT AATGA [1085] |
| 91 | <i>NAG</i> | N-acetylglucosaminidase | 2506026 | 125 | AAGTTGCTCAAATA CAAGCTG [1196] | TGATGTTAGCCCAAT CTACA [1197] |
| 92 | <i>norA23</i> | Quinolone resistance protein | 4115706 | 904 | GGTACTTGTTGCT GCTTTT [2754] | CGTAATCGCAATCGA AATA [2755] |
| 93 | <i>nuc</i> | Nuclease | 46623 | 71 | TGGCTATCAGTAAT GTTTCG [1088] | GAATCAGCGTTGTCT TCG [1089] |
| 94 | <i>rpoB</i> | RNA polymerase B-subunit | 677848 | 73 | TGGAAGACATCGT AAACGTA [1092] | TGGATCAAAGAAACG TGAAT [1093] |
| 95 | <i>tag</i> | DNA-3-methyladenine glycosidase | 6434027 | 81 | TTTTGATTTATCTTC TGACGG [1108] | CATTCATTTTATTCCC ACCT [1109] |
| 96 | <i>16SSa</i> | 16S rRNA | 46498 | 942 | TCTCTGATGTTAGC GGCGG [2830] | TCAGGCTTCGCCCA TT [2831] |
| 97 | <i>clfB</i> | Clumping factor B | 3393010 | 4 | TAGCATAGCAACAA ACAGTGA [954] | GTTTTGACCTGAAGC TGTATC [955] |
| 98 | <i>EDIN</i> | Epidermal cell differentiation inhibitor | 152997 | 113 | AAAGATAGTTCTAA GATAAATGGTC [1172] | GGCCATTATTGGTCT GTTG [1173] |
| 99 | <i>elkT-abcA</i> | Lantibiotic epilancin K7 translocator | 1841513 | 896 | ATTAGAAATTGCGA CTGGTG [2738] | AGCGTGTCATATCCT TCATC [2739] |
| 100 | <i>epiP-bspP</i> | Biosynthesis of lantibiotic epidermin; serine protease | 21204850 | 58 | CTTAGATGTCCCAT GCTGAT [1062] | GTCAAACGAGTGCTA ATGGT [1063] |
| 101 | <i>geh</i> | Lipase precursor; glycerol ester hydrolase | 153019 | 59 | TTCAATAGGCGTG GTGTC [1064] | TTATCTGTCGGTTTC TCTGG [1065] |
| 102 | <i>mreA</i> | ABC transporter | 7548683 | 907 | TACGATGACACCA GTCTTTG [2760] | ATCGACAAAACGTAC AGGAT [2761] |
| 103 | <i>murC</i> | UDP-N-acetylmuramoyl-L-alanine synthetase | 2642658 | 70 | GTATTATTGCTTGG GGTGAT [1086] | GGATATTTCTTTTCGT GCTGT [1087] |

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|-----|-----------------------|---|----------|-----|---|--|
| 104 | <i>sak</i> | Staphylokinase | 47425 | 126 | TGTTATTATTCTCA TTTTCTTCAAT [1198] | ATGCTCTGATAAATC TGGGA [1199] |
| 105 | <i>sea</i> | Enterotoxin A | 153120 | 127 | TTTTATTCATTGCC CTAACG [1200] | TTTTCAGAGTTAATC GTTTTATTATC [1201] |
| 106 | <i>sec1</i> | Enterotoxin C | 46566 | 129 | AATTTTTGGCACAT GATTTA [1204] | CTTTTATGTCTAGTT CTTGAGCTG [1205] |
| 107 | <i>etb</i> | Exfoliative toxine B precursor | 153011 | 115 | TTTAGCAGCGTCA ATTTT [1176] | CTGATCCAGAGTTTC CTACCT [1177] |
| 108 | <i>seb</i> | Enterotoxin B | 152999 | 128 | CGTAGATGTGTTTG GAGCTA [1202] | CTTGAGCAGTCACCT TTTTC [1203] |
| 109 | <i>sstC</i> | Iron transport protein | 3724154 | 80 | TGATATTGGAAGAT ATTAGCATAGA [1106] | TGACAATCGCTTTAT TCATTT [1107] |
| 110 | <i>tst</i> | Toxic shock syndrome toxin | 18266750 | 138 | TTTTATCGTAAGC CCTTTG [1222] | CAATAACCACCCGTT TTATC [1223] |
| 111 | <i>aacA- aphD</i> | Bifunctional aminoglyco- side modifying enzyme | 3676412 | 843 | AGATTTGCCAGAAC ATGAAT [2632] | TGTTGCATTTAGTCT TTCCA [2633] |
| 112 | <i>aadD</i> | Aminoglyco- side acetyl transferase | 21623792 | 837 | GCTATTGGTGTTTA TGGCTC [2620] | CTGATTGCTTAACTG CTTCA [2621] |
| 113 | <i>aph- A3</i> | 3'5'-amino- glycoside acetyl- transferase | 1272325 | 840 | GAGAATATCACCG GAATTGA [2626] | GCTCGACATACTGTT CTTCC [2627] |
| 114 | <i>blaZ</i> | β -lactamase | 1575124 | 827 | TGCTTTAGTTTTAA GTGCATGT [2600] | TCCTTCATTACACTC TTGGC [2601] |
| 115 | <i>cat</i> | Chlorampheni- col acetyl- transferase | 46651 | 862 | AGAAAATTGGGATA GAAAAGAA [2670] | CTGCAAGGCAACTG GTAT [2671] |
| 116 | <i>dfrA</i> | S1 dihydro- folate reductase | 3676404 | 859 | CAATTACCTTGGA CTTACC [2664] | CCCTTTTCTACGCAC TAAAT [2665] |
| 117 | <i>ermA</i> | rRNA methylase | 13785452 | 852 | CCAGAAAAACCCTA AAGACA [2650] | AAAGAACACGATATT CACGG [2651] |
| 118 | <i>ermC</i> | Adenine methylase | 4138444 | 846 | ACACAGTCAAACT TTATTACTTCA [2638] | CAACAAGTTTATTTT CTGTAGTTT [2639] |
| 119 | <i>msrS A</i> | Macrolide antibiotic resistance | 3892641 | 854 | GACAGATTTTCGAT CCCTTA [2654] | CCTTTTGTGTTTGAT GCACT [2655] |
| 120 | <i>mecA</i> | Penicillin bin- ding protein 2' | 13785452 | 802 | AGTTGTAGTTGTCTG GGTTTG [2550] | TGAAGTCGCTTTTCC TAGAG [2551] |

S. aureus, *E. coli* and *P. aeruginosa* genes were selected from the literature and databases, and compared by BLAST analysis to all other sequences available in the

NCBI database. Primers were designed to amplify gene segments of 200-810 bp length and devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J., Russel D.W., Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, NY (2001)).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 120 recombinant plasmids containing *S. aureus*, *E. coli* and *P. aeruginosa* gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobotics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 1.5: Hybridisation and scanning

All experiments described represent dual co-hybridisations of two different target DNA samples labelled respectively with Cy3, Cy5 or Alexa647. After removal of unbound label, Cy3 and Cy5/Alexa647 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilised in the dark. Prior to hybridisation the target DNA was reconstituted in 33 µl H₂O and 55 µl 2x hybridisation solution (Memorec Biotec GmbH, Cologne, Germany) and chemically denatured with 11 µl denaturation buffer D1 (Mirus) and neutralized with 11 µl buffer N1 (Mirus) according the instructions of the supplier. Hybridisation was automatically performed with a TECAN Hybridisation Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 60°C for 1 min with 0.2% SDS and 4x SSC and prehybridised in 120 µl denatured prehybridisation buffer (Memorec) for 30 min at 60°C at mild agitation. After injection of 110 µl labelled DNA, hybridisation was performed at 60°C for 18 hours at mild agitation. The arrays were washed at 50°C in primary

wash buffer (Memorec) - five cycles of 1 min wash time and 30 s soak time - and in secondary wash buffer (Memorec) - five cycles of 20 s wash time and 30 s soak time -, and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridised arrays were scanned with a Scan Array 5000 laser scanner (PerkinElmer). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5/Alexa647 dye, respectively. Fluorescent images were analysed by the ImaGene software (BioDiscovery, El Segundo, CA, USA).

Example 1.6: Specificity

In order to allow the simultaneous and rapid identification of *S. aureus*, *E. coli* and *P. aeruginosa* grown in blood culture specimens from septicemic patients, a microarray comprising a set of 40 *S. aureus*, 31 *E. coli* and 49 *P. aeruginosa* gene probes of 200 to 810 bp length was developed (Tab. 2).

The specificity of the DNA-chip was validated firstly (compare Example 1.1) with 45 well characterised clinical isolates and reference strains of the three target species as well as other related bacteria and secondly (compare Example 1.2) with 13 blood cultures from sepsis patients.

In all assays, three PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridised with the corresponding probes, indicating that labelling and hybridisation had performed efficiently.

Hybridisation experiments with *S. aureus*, *E. coli* and *P. aeruginosa* target DNAs, respectively, revealed specific hybridisation with the species-specific gene probes (Fig. 1). There was no cross-hybridisation between the three species with the exception of the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C), which hybridised also with *E. coli* and *P. aeruginosa* target DNA.

Identification of *E. coli*, *P. aeruginosa* and *S. aureus* reference strains, clinical isolates and blood cultures (BC) by microarray analysis corresponded by 100% with the conventional identification results (Fig. 1).

Example 1.7: Detection and discrimination

Example 1.7A: Detection and discrimination of *E. coli*

All DNA samples from 9 *E. coli* strains hybridised always with seven *E. coli* gene probes (*envZ*, *fes* (1) and (2), *nfrB*, *yachH*, *yagX*, *ycdS*) (Fig. 1A, columns 19 to 27);

in the following these genes are designated as core genes. With 14 *E. coli* gene probes variable hybridisation was observed including the antibiotic resistance gene probes *bla-TEM106*, *sul*, *strB* and *aacC2*. Such a variable hybridisation profile is expected for antibiotic resistance genes since acquired resistance to antimicrobials is strain specific. For 11 *E. coli* virulence gene probes (*eae*, *eltB*, *escR*, *escT*, *escU*, *espB*, *hlyA*, *hlyB*, *SLTII*, *toxA-LTPA*, *VT2vaB*) no hybridisation signals were detected with any of the tested *E. coli* isolates and blood cultures. Since these virulence genes are known to be specific for particular *E. coli* pathotypes (Bekal, S. et al., J. Clin. Microbiol., 41:2113-25 (2003)), it was not surprising that they were not present in the tested strains. The *eae*, *esc* and *esp* genes for example are encoded on a chromosomal pathogenicity island, which is typical for enteropathogenic *E. coli* exhibiting the unique virulence mechanism known as attaching and effacing (AE) (Elliott, S.J. et al., Mol. Microbiol., 28:1-4 (1998)). The alpha-hemolysin (*hly*) operon is encoded on a large plasmid of enterohemorrhagic *E. coli* strains (Schmidt, H. et al., Infect. Immun. 63:1055-61 (1995)).

Example 1.7B: Detection and discrimination of *Pseudomonas aeruginosa*

DNA samples obtained from *P. aeruginosa* uniformly hybridised with 32 out of 49 *P. aeruginosa* specific gene segments including the *mexA* gene probe (core genes). Variable hybridisation was observed with 17 probes allowing for discrimination of individual *P. aeruginosa* isolates (Fig. 1B, columns 12 to 18).

Example 1.7C: Detection and discrimination of *S. aureus*

Hybridisation experiments performed with 11 *S. aureus* target DNAs revealed signals in all assays with 16 *S. aureus* gene segments (core genes) (Fig. 1C, columns 1 to 11). Variable hybridisation was observed with 14 *S. aureus* gene probes including the 6 antibiotic resistance gene segments *aadD*, *aacA-aphD*, *blaZ*, *dfrA*, *ermA* and *mecA* and the virulence genes *sak*, *sea*, *sec1* and *EDIN*. The gene probes *geh*, *mreA*, *clfB* and *elkT-abcA* hybridised with 8, 10 (*mreA* and *clfB*) and 6 target DNAs respectively. However, PCR amplification of the four genes was positive for all 11 *S. aureus* target DNAs (not shown) suggesting that the four genes were present in all strains investigated and that these gene probes did not allow reliable detection of the four genes in *S. aureus*.

No hybridisation was observed with 10 probes including the toxin genes *seb*, *tst* and *etb*. In contrast to the community-acquired, multi-susceptible MRSA strain

MW2 that hybridised to *mecA* and *blaZ* only, all six clinical MRSA strains showed the same multiresistant hybridisation pattern and their DNA hybridised to *ermA* (erythromycin resistance), *mecA* (oxacillin resistance) and the *aadD* gene (tobramycin resistance). As for the majority of multiresistant MRSA strains the *ermA* and *aadD* genes were shown to be located upstream and downstream, respectively, of the *mecA* gene in the *mec* chromosomal region (Chambers, H.F., Clin. Microbiol. Rev., 10:781-91 (1997); Polyzou, A. et al., J. Antimicrob. Chemother., 48:231-4 (2001)). Hybridisation to the core gene probes permitted the identification of *S. aureus*, while hybridisation to antibiotic resistance gene probes allowed for discrimination of strains.

Example 1.7D: Discrimination of *E. coli*, *P. aeruginosa* and *S. aureus* from related bacterial species

Co-hybridisation experiments performed with related bacterial species confirmed the high specificity of the DNA-chip (Fig. 1): For *S. epidermidis* and all other Coagulase-negative staphylococci, cross-hybridisation was observed only with the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C) and several common staphylococcal antibiotic resistance determinants (*aadD*, *aacA-aphD*, *aph-A3*, *blaZ*, *cat*, *dfrA*, *ermA*, *ermC*, *mdrSA*, *mecA*) (Fig. 1C, columns 28 to 36). There was no cross-hybridisation with other metabolic or virulence genes of *S. aureus*.

The *Micrococcus* spp. isolate showed no hybridisation with the DNA-chip (column 53). Streptococci (column 56 to 58) and enterococci (columns 54 and 55) showed hybridisation with the staphylococcal 16S RNA gene probe and once with the staphylococcal *aph-A3* aminoglycoside resistance gene probe (*Enterococcus* spp.) (Fig. 1C). Out of 12 strains of seven Gram-negative species (columns 41 to 52), two hybridised with the *S. aureus* 16S rRNA gene probe (*Klebsiella pneumoniae* and *Proteus mirabilis*, Fig. 1C, columns 41 and 47) and one clinical isolate of *Proteus mirabilis* hybridised with the *E. coli* resistance genes *bla-TEM106* (β -lactam resistance), *sul* (sulfonamide resistance) and *strB* (streptomycin resistance) (Fig. 1A, column 42). *Serratia*, *Stenotrophomonas*, *Acinetobacter* and *Enterobacter* species showed no cross-hybridisation with any gene probe.

Example 1.8: Sensitivity

While the majority of *P. aeruginosa* probes allowed unambiguous identification, some probes showed variable hybridisation patterns when microarray hybridisation

was performed with different target DNA samples prepared from the same isolate (Tab. 3).

Tab. 3: Microarray hybridisation signals obtained with different target DNA preparations of *Pseudomonas aeruginosa* isolates.

| | Isolate | | | | | | | | | |
|--|------------------|------------------|-------------------|------------------|--------------------|------------------|-------------------|-------------------|--------------------|--|
| | C4242 | | | C3853 | | C3045 | | C3755 | | |
| DNA amount [ng] | 130 ^a | 382 ^a | 1350 ^b | 510 ^a | >2400 ^b | 550 ^a | 2950 ^b | 1180 ^b | >1600 ^b | |
| BDR ^c | 22 | 75 | 48 | 29 | 30 | 90 | 41 | 139 | 40 | |
| No. of hybridised gene probes ^d | 38 (88%) | 31 (72%) | 43 (100%) | 36 (88%) | 41 (100%) | 34 (89%) | 38 (100%) | 41 (95%) | 43 (100%) | |

^a Labelled with Alexa647

^b Labelled with Cy3 or Cy5

^c BDR: Base to dye ratio; number of nucleotides per one dye molecule

^d Number of signals obtained with *P. aeruginosa* capture probes (total 49) after hybridisation with different DNA preparations. The percentage of specific hybridisations is compared to the highest number of signals obtained for each isolate (100%).

Successful hybridisation with strong fluorescent signals depends on efficiency of DNA labelling (ratio of bases per one dye molecule) and amount of labelled DNA. For the different target DNA preparations of four clinical isolates, variable hybridisation was observed with 14 gene probes (*uvrDII*, *vsmI*, *pa1069*, *rhIR*, *rhIA*, *rhIB*, *1046*, *pyocinS*, *pyocinS1im*, *plcR*, *plcN*, *PHZb*, *rbf303* and *pIIAp2*). For example, for three different DNA preparations of isolate C4242, hybridisation to *Pseudomonas*-gene probes varied from 31 to 43 probes, respectively, depending on the labelling efficiency and amount of DNA (Tab. 3). The lowest number of signals was detected with 382 ng target DNA, that, however, showed a high base to dye ratio of 75. Overall, the results suggest that varying amounts of DNA and base to dye ratios influenced the hybridisation results of few gene probes. However, irrespective of the varying quality and quantity of the labelled target DNA, 35 of the 49 *P. aeruginosa* gene probes showed robust hybridisation results in all performed experiments.

Example 1.9: Detection and characterisation of pathogens in blood cultures

Although DNA prepared from blood cultures comprises a mixture of human and bacterial DNA, the resulting hybridisation signals obtained with DNA from 1 ml positive blood culture allowed a clear and unambiguous characterisation of *S. aureus*, *E. coli* and *P. aeruginosa* present in 13 tested blood specimens (Fig. 1). In accordance to the VITEK2 characterisation, positive BACTEC® cultures were identified by microarray hybridisation as multi-resistant MRSA (Fig. 1C, column 8), penicillin-resistant *S. aureus* (column 9 and 11), multi-susceptible *S. aureus* (column 10), *E. coli* (Fig. 1A, columns 26 and 27), *P. aeruginosa* (Fig. 1B, column 18), and discriminated from oxacillin resistant *Staphylococcus epidermidis* (columns 33-35), *Proteus mirabilis* (column 43) and *Streptococcus pneumoniae* (columns 57 and 58).

Example 1.10: Correlation between susceptibility testing and microarray hybridisation of selected antibiotic resistance genes

S. aureus: For 11 *Staphylococcus aureus* strains and blood cultures, susceptibility results determined by the VITEK2 system, Etest strips and disk diffusion tests were compared with the results of the microarray hybridisation assay for the simultaneous detection of antibiotic resistance genes (Tab. 4). The presence or absence of resistance genes as indicated by microarray hybridisation was confirmed by PCR with gene specific primers (results not shown).

Tab. 4: Correlation between phenotypic and genotypic antibiotic resistance for 11 *S. aureus* isolates and blood cultures.

| a) Penicillin resistance ^a | | Hybridisation with <i>mecA</i> / <i>blaZ</i> | |
|---------------------------------------|--|---|----------|
| | | No. pos. | No. neg. |
| 10 (resistant) | | 10 | 0 |
| 1 (susceptible) | | 0 | 1 |
| b) Oxacillin resistance | | Hybridisation with <i>mecA</i> | |
| | | No. pos. | No. neg. |
| 7 (resistant) | | 7 | 0 |
| 4 (susceptible) | | 0 | 4 |
| c) Erythromycin resistance | | Hybridisation with <i>ermA</i> , <i>ermC</i> or <i>msrA</i> | |

| | No. pos. | No. neg. |
|----------------------------|-------------------------------------|----------------|
| 6 (resistant) | 6 | 0 |
| 5 (susceptible) | 0 | 5 |
| <hr/> | | |
| d) Tobramycin resistance | Hybridisation with <i>aadD</i> | |
| | No. pos. | No. neg. |
| 5 (resistant) | 5 | 0 |
| 6 (susceptible) | 0 | 6 |
| <hr/> | | |
| e) Gentamicin resistance | Hybridisation with <i>aacA-aphD</i> | |
| | No. pos. | No. neg. |
| 0 (resistant) | 0 | 0 |
| 11 (susceptible) | 0 | 11 |
| <hr/> | | |
| f) Trimethoprim resistance | Hybridisation with <i>dfrA</i> | |
| | No. pos. | No. neg. |
| 1 (resistant) | 0 | 1 ^b |
| 10 (susceptible) | 0 | 10 |

^a Number of strains tested for resistance

^b *dfrA* gene detected by PCR

For the *S. aureus* strains there was a 100% correlation between phenotypic resistance to penicillin and hybridisation to the *mecA* and/or *blaZ* gene (both genes confer resistance to penicillin, Tab. 4a). Phenotypic resistance to oxacillin correlated 100% with the hybridisation of the *mecA* gene (Table 4b), between resistance to erythromycin and hybridisation to the erythromycin resistance genes *ermA*, *ermC* or *msrSA* (Tab. 4c) and between resistance to tobramycin and hybridisation to the *aadD* gene (Tab. 4d). Furthermore, they all showed 100% correlation between phenotypic susceptibility to gentamicin and no hybridisation to the resistance genes *aacA-aphD* (Tab. 4e). Notably the *dfrA* gene of the trimethoprim resistant strain MW2 (MIC of 1 µg/ml) was not detected by microarray hybridisation (Tab. 4f), whereas PCR amplification revealed the presence of the *dfrA* gene.

E. coli and other Gram negative bacteria: The prototype microarray harboured only

four *E. coli* and one *P. aeruginosa* resistance gene probes which do not yet allow a comprehensive prediction of antibiotic resistances. Nevertheless, hybridisation with the *E. coli* resistance gene probe *blaTEM106* was observed in one *P. mirabilis* and four *E. coli* strains and correlated with phenotypic ampicillin resistance for all five strains (Tab. 5).

Tab. 5: Correlation between ampicillin/penicillin resistance, gentamicin/tobramycin resistance and streptomycin resistance and hybridisation with the resistance gene probes *blaTEM-106*, *aacC2*, *aph-A3* and *strB*, respectively.

| Species | Resistance phenotype ^a | Hybridisation with | | | |
|--|-----------------------------------|--------------------------------|---------------------------|----------------------------|--------------------------|
| | | <i>blaTEM-106</i> ^b | <i>aacC2</i> ^b | <i>aph-A3</i> ^c | <i>strB</i> ^b |
| <i>E. coli</i> ATCC 25922 | susceptible | - | - | - | - |
| <i>E. coli</i> C4821 | AMP, STR | + | - | - | + |
| <i>E. coli</i> F3437 | AMP | + | - | - | - |
| <i>E. coli</i> C3941 | AMP, STR | + | - | - | + |
| <i>E. coli</i> F1806 ^d | AMP, GEN, TOB, STR | + | + | + | + |
| <i>E. coli</i> C4547 | AMPi | - | - | - | - |
| <i>E. coli</i> C4230 | AMP | - | - | - | - |
| <i>E. coli</i> C3940 | susceptible | - | - | - | - |
| <i>E. coli</i> F1642 ^d | STR | - | - | - | + |
| <i>P. mirabilis</i> C4024 | AMP, STR | + | - | - | + |
| <i>P. mirabilis</i> C4403 | susceptible | - | - | - | - |
| <i>P. mirabilis</i> F1738 ^d | susceptible | - | - | - | - |

^a AMP, ampicillin; GEN, gentamicin; STR, streptomycin; TOB, tobramycin; i, intermediate

^b *E. coli* gene probes

^c *S. aureus* gene probes

^d Positive blood culture

One *E. coli* blood culture showed also resistance to tobramycin and gentamicin. This phenotypic resistance correlated with the hybridisation of the *aacC2* gene probe for aminoglycoside resistance and the *S. aureus aph-A3* probe for tobramycin/kanamycin resistance (Tab. 5). For one *P. mirabilis* and four *E. coli*

strains, phenotypic resistance to streptomycin correlated with hybridisation to the *strB* probe (Tab. 5).

All *P. aeruginosa* strains hybridised with the *mexA* gene probe (Fig. 1) and showed phenotypic resistance to tetracycline, trimethoprim/sulfamethoxazole, penicillins (ampicillin, mezlocillin) and cephalosporines (cefazolin, cefixime, cefuroxime). The *mexA-mexB-oprM* operon is a determinant for a three component efflux system responsible for intrinsic and acquired multiresistance in *P. aeruginosa* (β -lactams, fluoroquinolones, trimethoprim, sulphonamides, chloramphenicol and others) (Poole, K., Clin. Microbiol. Infect. 10:12-26 (2004)).

10 Example 1.11: Microarray for specific detection of *S. aureus*

A) Strains and Cultures

Reference strains and clinical isolates: The following bacteria were purchased from the American Type Culture Collection (ATCC, Manassas, Va.) or the Deutsche Sammlung für Mikroorganismen und Zellkulturen (DMSZ, Braunschweig, Germany) and were used for evaluation of the specificity of the microarray: *Staphylococcus aureus* (ATCC 29213), *Staphylococcus epidermidis* (ATCC 12228; ATCC 18610) *Staphylococcus saprophyticus* (ATCC 14953), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853). Ten clinical MRSA (methicillin resistant *S. aureus*) isolates were obtained from the inventors' clinical routine microbiology laboratory.

Bacterial cultures: Bacterial strains and clinical isolates were plated either onto sheep blood or onto Mueller-Hinton agar from 50% glycerol stocks. One colony was then picked and transferred to 5 ml Luria-Bertani (LB) broth and cultured overnight at 37°C.

25 Blood cultures: Aerobic blood culture bottles (BACTEC® Plus aerobic, Becton Dickinson, Heidelberg, Germany) were inoculated with 100 CFU of *S. aureus* after adding 10 ml blood from healthy volunteers. A BACTEC® 9240 blood culture system (Becton Dickinson) - a continuous reading, automated, and computed system detecting the growth of microorganisms by monitoring CO₂ production - was used for incubation according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and an aliquot of 1 ml of the blood culture suspension was taken aseptically with a needle syringe. The

aliquot was equally divided, with one part for subculture on agar plates and CFU determination, and one part for DNA isolation.

Additionally, in order to test the microarray upon real conditions, samples were collected from ten clinical positive blood culture specimens cultivated under the same conditions as described above. Six of them were positive for different *S. aureus* strains and four for other bacterial species (*Staphylococcus epidermidis*, *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca*). Blood culture aliquots of 500 µl were used for DNA preparation.

B) Generation of the *S. aureus* specific microarray

About 140 gene segments of *S. aureus* genes, but also a few of CoNS (SEQ ID NO: 177,178,179), were selected from the literature and nucleotide databases in order to cover different functional categories (virulence factors, species-specific metabolic and structural features, antibiotic resistance determinants). Tab. 6 provides the complete list of selected genes with gene symbol, gene function and SEQ ID NO of the segments.

Tab. 6: Selected *S. aureus* genes, selected segments (SEQ ID NO) and primers used for segment amplification (SEQ ID NO)

| Gene symbol | Functions | gene probe SEQ ID NO | Primer forward [SEQ ID NO] | Primer reverse [SEQ ID NO] |
|--------------|--|-------------------------|--|--|
| <i>atl</i> | autolysin | 99 | AGCTGAGACGACACA AGATCAAA [1144] | TTATATTGCGTTTCAAGA GCTGC [1145] |
| <i>aroA</i> | 3-phosphoshikimate 1-carboxyvinyl- transferase | 84 | ACCTTCAATATTCGCA TCC [1114] | TATTCCGATTATTAGGCG TAG [1115] |
| <i>aroC</i> | Chorismatsynthase | 83 | ATGAGATACCTAACAT CAGGAGAATCA [1112] | GCTATTCTTCCATCTAATT TACGATCATA [1113] |
| <i>aroE</i> | Shikimatdehydrogenase | 95 | GTTATCAATTAATACA ACCCCTGAAGC [1136] | TGGAACATAATTCTCCTTC GATTGTTA [1137] |
| <i>aroF</i> | 3-deoxy-D-arabino- heptulosonate-7- phosphate synthase | 96 | GTAGTTGAAAATATG CCTGTTGGTGT [1138] | ATTACACCATTAACGATA ATTGGCAT [1139] |
| <i>aroG</i> | Chorismat-Mutase | 97 | AGACTTATTATCTAAA CGTGGTGAAGTAGC [1140] | CAAATGATTTATTGCCGT CTCCTA [1141] |
| <i>asp23</i> | alkaline shock protein | 98 | AAAATTGCTGGTATC GCTGCA [1142] | GTCATTACATCATCAACTT GCATGTTA [1143] |
| <i>cata</i> | catalase | 1 | TAAATTGTTTAGATTA CAATCAGAGG [948] | TTCAAAGTTTTCGTATGTT TCA [949] |

| | | | | |
|--------------|--|----|--|---|
| <i>clpC</i> | endopeptidase | 7 | AATGCTGCTAACCTG CGTGAT [960] | CACGTCTAACCGCTTTAC TGATTG [961] |
| <i>clpP</i> | endopeptidase | 8 | AAAGTAAAGAGTAGA CTAAGCTGTCTGCTC [962] | ACCTAATAAAATTCAAGC ATTGGGA [963] |
| <i>ctaA</i> | cytochrome biosynthesis | 9 | AAGAATTTAAATGGT TAGGTGTCGTA [964] | ACGTAATCGTTTTGTTGC CAAATA [965] |
| <i>ctsR</i> | transcription repressor of class III stress genes homologue | 10 | AACGTCCCATGCCATT AATTTT [966] | TTGCGTTTCTATTTAGCTC AGACA [967] |
| <i>dltA</i> | D-alanine-D-alanyl carrier protein ligase | 11 | ACAGAGCAGCAAAAG CGTTAGTG [968] | GACCTTGAATGAACCATT GACCAT [969] |
| <i>dltB</i> | hypothetical membrane transporter | 12 | CATATGGTGATTTTAC ATTCTTCTTAATTG [970] | CCTAACCATGTACTTTGT AACACTTTCA [971] |
| <i>dltC</i> | D-alanyl carrier protein | 13 | AAATTTATTAGCAGAA GTAGCAGAAAATG [972] | CTGAACTCTTCTAATGCTT CAACGATT [973] |
| <i>dnaK</i> | Heat-shock-protein | 14 | TTTAGGCGAAAATATT GGTGAAGA [974] | TTTGTCGTCGTCTTTTACT TCGTT [975] |
| <i>elkT</i> | antibiotic epilancin K7 translocator | 15 | GGTCTTATCGTTGCA GCTATCACTAT [976] | GAGCGTATCGCATAAATA ATCTTTTC [977] |
| <i>eno</i> | 2-phosphoglycerate dehydrogenase | 87 | CGATGTTTCATCATTGG TACTGGTA [1120] | GGTGTTACTAAAGCAGTT GAAAACG [1121] |
| <i>glnA</i> | glutamine synthetase; belongs to the femC locus | 17 | TAGTCACCATGAAGTT GCCCC [980] | CCTCTTGAAGATGGTACA CGGAT [981] |
| <i>glnR</i> | glutamine synthetase repressor; belongs to the femC locus | 18 | CGAATGATGCAATCA GACGAAA [982] | CACCACGATTTATTGGCA AAGTT [983] |
| <i>grlA</i> | DNA topoisomerase IV subunit A | 19 | TTGAATCACCAAATTG AGGTTGT [984] | CAGTCGTTTCAGATTTGAA TTTCTTT [985] |
| <i>grlB</i> | gyrase-like protein beta subunit B | 20 | AAATCCATCGAGATG GTAATATATATCA [986] | AAACTTAAATACTTTCTG AATATTGATCAT [987] |
| <i>groEL</i> | stress response; heat shock protein | 21 | GTATGCAATTTGATCG TGTTTAT [988] | TGTTAATGCATCGCCTTC AAC [989] |
| <i>groES</i> | stress response; heat shock protein | 22 | ATGTATGTTAGCACTC TTTAATGTAAAGTG [990] | GTTTAGTTGTGTTTCATT TCGTT [991] |
| <i>gyrA</i> | DNA gyrase subunit A | 60 | CATCATTAATTCGATT CCCTGAAT [1066] | TCATTTACTTCATCTGCAT CCTCTT [1067] |
| <i>gyrB</i> | DNA gyrase subunit B | 61 | TCAATTTGACTTAAAA GAAGTTGGC [1068] | AAGATTTGTGGCATATCC TGAGTTA [1069] |
| <i>hemA</i> | Glutamyl-transfer RNA reductase | 23 | TGTCATATTATCAACA TGTAATCGAACTG [992] | AATATCAGTAATTCCAGA ACCAAGAAGAT [993] |
| <i>hemB</i> | Porphobilinogene synthase | 62 | TTGATAGACATAGAA GATTGAGATCATCAG [1070] | ACTTGAGAAATTGCTGTT TTAACAAGTAG [1071] |
| <i>hemC</i> | Porphobilinogene deaminase | 63 | GTAATTAGTCGTTG GCTCCAGAAG [1072] | GGGATAGTGGTGTATGTG TTTTAGAAATA [1073] |

| | | | | |
|-------------|--|----|--|--|
| <i>hemD</i> | Uroporphyrinogene III synthase | 64 | TGTTGATAACATTGCTGTGATAGGAA [1074] | AATGCATCGATTTGTTGATGTTCTA [1075] |
| <i>hemE</i> | Uroporphyrinogene decarboxylase | 24 | AAAATGATCAAAGGTGAAGAAACATC [994] | AATCCTCGACATTTAATGCACCTAC [995] |
| <i>hemH</i> | Ferrochelatase | 25 | AATGGGATTATTAGTTATGGCTTATGG [996] | GTGGATATGGATCATTATTCTTTTCG [997] |
| <i>hemL</i> | GSA-1-Aminotransferase | 26 | ATGAGATATACGAAATCAGAAGAAGCA [998] | CTAATCTTAAAGTATCCAA TG TAGCTTCTGTA [999] |
| <i>hemN</i> | oxygen-independent coproporphyrinogen oxidase | 65 | ACAGAATCAACCTGTAGATGAGTACTTAGAT [1076] | TGATATTCGTATAACGCACACCATC [1077] |
| <i>hemY</i> | putative involved in a late step of protoheme IX synthesis | 27 | AAACAGCAAGATCCTAATATTGATGTAAC [1000] | CTCTACGTACAATCGATAC TAATTCATTATCT [1001] |
| <i>lepA</i> | GTP-binding protein | 28 | ATTAACAAAATTGATTACCTGCTGC [1002] | CTATAACCAAAACCTAATGCTTGTGAC [1003] |
| <i>lrgA</i> | holin-like protein LrgA | 29 | AAAGACGCATCAAAAC CAGCA [1004] | GGCTAATGACACCTAAAGAGTTAACAAC [1005] |
| <i>lrgB</i> | holin-like protein LrgA | 30 | GATTAACCACTTAGCACTAAACACACCT [1006] | AATGTTTAACAAGCACTT CACGCT [1007] |
| <i>lytM</i> | peptidoglycan hydrolase | 31 | CGACAAACACCCAACAAGCA [1008] | TGGCTGTTATACGCTTGG TTGT [1009] |
| <i>menB</i> | naphthoate synthase | 32 | GTTATCGTATTAACGTGTGAAGGTGATT [1010] | ACATTTAGTACATTACCG CCACCTAC [1011] |
| <i>menC</i> | o-succinylbenzoic acid synthetase | 69 | TTTAAGTCACAAATTGTAACACCGAA [1084] | TTAATTTAATTCTGGTCG GCTTTGT [1085] |
| <i>menD</i> | 2-Succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylase | 33 | CGTAAGGGGAAGTAGTTATCAGTCCG [1012] | TTAGCTGTATACTCGAAATCCAATCC [1013] |
| <i>menE</i> | O-succinylbenzoic acid-CoA ligase | 34 | ATGGACTTTTGGTTATATAACAAGCAC [1014] | TATTTCAAGCAATGTCACCGTATTA [1015] |
| <i>menF</i> | Isochorismate-Synthase | 35 | ATTGATAATTTACATCCAACACCTGC [1016] | TCACTATCTGGATCAGAA TCTTTAACAAT [1017] |
| <i>murC</i> | UDP-N-acetylmuramoyl-L-alanine synthetase | 70 | CTTGGGGTGATGATGAACATCTA [1086] | AAGTGTGTGGTTGAAATAC TGCAA [1087] |
| <i>mutL</i> | DNA mismatch repair protein | 38 | TCGTTTACATCATAATAATCATCAGAC [1022] | ACACAGAGAATAACCAGGAGAAGA [1023] |
| <i>mutS</i> | DNA mismatch repair protein | 39 | TTGTAATTCACCTTAAC TTCACCAATG [1024] | TCAAGTTGCGAAATTAGCTGA [1025] |
| <i>pbg</i> | porphobilinogen synthase | 41 | GGTGTTCCAAACCTCAAAGATGATATA [1028] | TTGACACCATAACTCATTATAGGAATATTG [1029] |
| <i>pdhB</i> | pyruvate dehydrogenase (lipoamide): subunit E1beta | 43 | TGACATTTCAAATCAATCACATCG [1032] | TTGGTAACCAAACATTTTCAGCTT [1033] |

| | | | | |
|-------------|--|-----|--|--|
| <i>pdhC</i> | dihydrolipoamide acetyltransferase: subunit E2 | 44 | CTGGAGATACTATTG AAGAAGACGATG [1034] | TTGCTTTTACAGTTCTGTT TTCATCTAC [1035] |
| <i>pdhD</i> | dihydrolipoamide dehydrogenase: subunit E3 | 72 | CAGGTAAATTAGTTGT AGTTGGTGGAG [1090] | AGTGGTAAACCTGGAACG ATATCA [1091] |
| <i>rpoB</i> | RNA polymerase B-subunit | 73 | ATTGTTACGTGCATTA GGTTTCTCA [1092] | TTTCTACTGGCTCGTCTAT AACGC [1093] |
| <i>rsbU</i> | putative operon encoding alternate sigma factor | 45 | TAGTTATCGAGATTAT CAAAGATTGGTAGA [1036] | GTAATTGTGAGTGTCCAT AAGAATCCA [1037] |
| <i>rsbV</i> | putative operon encoding alternate sigma factor | 46 | TGAATCTTAATATAGA ACAACCACTCAAG [1038] | ACGATCTGACACACCTAA AATGTA [1039] |
| <i>rsbW</i> | putative operon encoding alternate sigma factor | 47 | TCTAAAGAAGATTTTA TCGAAATG [1040] | CCCACATTGTTATTTTCTT TGTAT [1041] |
| <i>sdrC</i> | serine-aspartate repeat protein multigene family | 139 | GAAAGTATTCTGTAG GTACTGCTTC [1224] | CCTTTATCAATCGCAATG TC [1225] |
| <i>sdrD</i> | serine-aspartate repeat protein multigene family | 140 | CGGGCAAATAAATAA AGATG [1226] | AACTGAAGATAAGCCGTT TG [1227] |
| <i>sdrE</i> | serine-aspartate repeat protein multigene family | 141 | TCTGTCGCAGTTTTAT CAGTTGAAG [1228] | GCAAAACAAGATGATGCA ACG [1229] |
| <i>sgp</i> | G protein | 48 | TGAGATAGATGCAAT CATGTTTATGG [1042] | GAAATAGGTACAATCTCT GTAAAGTCCATATA [1043] |
| <i>sigB</i> | sigma factor B | 78 | GATGGTTCAACTGTTA CGCTATTA [1102] | CTCTGAAGTCGTGATACA TGCA [1103] |
| <i>sirR</i> | sit operon metal dependent repressor | 49 | AATATAATTGGGAAG AAGTACATCAAGAAG [1044] | ATATTAGCAAATCGGTCT TATCTCTCA [1045] |
| <i>sodA</i> | superoxide dismutase | 50 | TTGAATTACCAAAT ACCATACG [1046] | CTCCCAGAATAATGAATG GTTTAAAT [1047] |
| <i>sodB</i> | superoxide dismutase | 51 | GCGCATTTTGAAAAG GCA [1048] | GGGATAGCACGTAAAAGT GGAA-[1049] |
| <i>srtA</i> | transpeptidase; sortase that anchors surface proteins to the cell wall | 91 | CTGGTCCTGGATATA CTGGTTCTTT [1128] | GATTAATGACAATCGCTG GTGTG [1129] |
| <i>sstA</i> | iron transport proteins | 52 | TTCGTTGTTTCATAGGT GCGAGT [1050] | CTTTGAACAGCACTCGTG CG [1051] |
| <i>sstB</i> | iron transport protein | 53 | TATTGCCTTATTTAGA TGTATTGCTTTT [1052] | TCGTAGCTTCAAACACAT TTCAA [1053] |
| <i>sstC</i> | iron transport protein | 54 | AATCAAATGATATTGG AAGATATTAGCA [1054] | TATTCAGTATCTTGTGCTA TTGTCATTG [1055] |
| <i>sstD</i> | iron transport protein | 55 | CATGCGGTAACAATT CTGATAAAGA [1056] | AATTTTCGCTTTAGGTGC AGCT [1057] |

| | | | | |
|-------------|--|-----|---|---|
| <i>stpC</i> | Potential ABC transporter | 92 | TTAACAATAGAACATT TAACAAAGAAG [1130] | CTCGAAATTAAGAAAGTA ACACC [1131] |
| <i>tag</i> | DNA-3-methyladenine glycosidase | 81 | GCATTTGGTACTAAA GATCCAGTCTACT [1108] | AACGAAAATACTGTTACT GGACCTAAAA [1109] |
| <i>trx</i> | thioredoxin reductase | 56 | GCTGACTATGAAGGT AAAGCTGACA [1058] | CAGCTAAGTTTTCTTTTG GTTGGA [1059] |
| <i>tyrA</i> | prephenate dehydrogenase | 82 | ATTCATTTAGTCAGTG GTCATCCAAT [1110] | GCTGTCTGAATCATTCTA AAATATACGT [1111] |
| <i>yhiN</i> | yhiN-protein | 57 | CAATTGGCTTTCGATT ATTGTTGTA [1060] | AACCAATGATCTAGTGTA AATGTTAAACCT [1061] |
| | Virulence Factors | | | |
| <i>clfA</i> | clumping factor A | 3 | GCTTCAGTGCTTGTA GGTACGTAA [952] | TTGATTCACTAATTCCTCC GCAT [953] |
| <i>clfB</i> | clumping factor B | 4 | TAATGATACATCTGAT ATTAGTGCAAACAC [954] | TTTAGCATCAGCAGCATT TACTACC [955] |
| <i>cna</i> | collagen adhesin | 85 | TCGAGGAATTAACAA AGGTC [1116] | ATCAGGTTTAGTTGGTGG TG [1117] |
| <i>coa</i> | staphylocoagulase | 5 | TGTTAGGGATACACA ACATAAACTGA [956] | GATTTTGTTCAGATTCAC CGTATTT [957] |
| <i>ebpS</i> | cell surface elastin binding protein | 86 | GAACCTAGCCATCAA GACAG [1118] | GCATTATTAGAGGCATGT GG [1119] |
| <i>EDIN</i> | Epidermal cell differentiation inhibitor | 113 | TATCTTTAGCATTAAG CGTTTATTCAAT [1172] | TTTCTAACTAGATTTTCAT CATACTGGC [1173] |
| <i>eta</i> | exfoliative toxine A precursor | 114 | TGCATTTAATTTACCA AAAGAGCTT [1174] | TGGATAGCCTATTAATTC GAGTTTG [1175] |
| <i>etb</i> | exfoliative toxine B precursor | 115 | AAGAGCTTTATACACA CATTACGGATAA [1176] | CAAAATATTGAGAATCAT TGAACATTTT [1177] |
| <i>fbpA</i> | fibrinogen binding protein | 88 | CTCTTTTACCTTTGA CGTTGGATT [1122] | GCCAAAATAGTGCTTCAA TATCAGA [1123] |
| <i>fib</i> | fibrinogen binding protein | 89 | GCTTTTCTGTGTGCAC TGACAGT [1124] | AGCGAAGGATACGGTCC AAG [1125] |
| <i>fnbA</i> | fibronectin-binding protein | 93 | TTACATCTGTACCCGT TTCCACTT [1132] | AAACTGCACAACCAGCAA ATATAGA [1133] |
| <i>fnbB</i> | fibronectin-binding protein | 90 | CCGCCTTAATTCCTTC TCCAAA [1126] | GCGAGTTGATTTGCCATC GG [1127] |
| <i>geh</i> | lipase precursor; glycerol ester hydrolase | 59 | GAACAAGGGAATGCG ATAACG [1064] | AGGTGCAGTTTTATCATT AGACGG [1065] |
| <i>hla</i> | alpha-hemolysin | 120 | ATGATGAAAATGAAA ACACGTATAGTC [1186] | ATTTGAGCTACTTCATTAT CAGGTAGTTG [1187] |
| <i>hlb</i> | beta-hemolysin | 121 | TGTTAATAAAGGCACT CCAGAGTTC [1188] | CTTTGATTGGGTAATGAT CTGAAAA [1189] |
| <i>hld</i> | delta-hemolysin | 110 | TTTTATCTTAATTAAG GAAGGAGTGATTC [1166] | TAGTGAATTTGTTCACTG TGTCGATAA [1167] |

| | | | | |
|------------------|--|-----|--|---|
| <i>hlgA_C</i> | gamma-hemolysin component A; C-terminus | 117 | ACTGAAGTAGAAAGT CAGAACTCTAAAGGT [1180] | GTGTTTTCCAGTTCACCTC ATATTTAACT [1181] |
| <i>hlgA_N</i> | gamma-hemolysin component A; N-terminus | 116 | CTTAAAATTAAATAGA AAGAAAGT [1178] | ATGTTTTGAGTTATAGCT AATCGTT [1179] |
| <i>hlgB</i> | gamma-hemolysin component B | 118 | ATAGCTTCCACCCAAC ATATGGTAA [1182] | ATTTCACTTTGTGATTTTC CCAATC [1183] |
| <i>hlgC_C</i> | gamma-hemolysin component C; C-terminus | 119 | AATCAGCATTTGATAG CGATTTATTT [1184] | CCAATTGACTTCATATTTTC ACAGTGTA [1185] |
| <i>hysA</i> | hyaluronate lyase | 111 | AAACATCAAATCGCT GTGGCT [1168] | GTGAAAGATGCCCTTGAG TGG [1169] |
| <i>IgGbg</i> | IgG-binding protein | 112 | GGGTTCTTGCTGTCTT TAAGTGATT [1170] | TATATCTCGAAGTTGCTA GTTGGGG [1171] |
| <i>lip</i> | lipase; glycerol ester hydrolase | 68 | TTTTAAGTGGTGGAC AAGCACAA [1082] | GATTGTTATTAGCGTTTG AATCTTGAC [1083] |
| <i>lukF</i> | leucocidin F | 122 | CATATGGCAGAGATA GTTATCATTCAACT [1190] | GATGTATGAGTTGCTCTT ATGTGATCTTTA [1191] |
| <i>lukS_C</i> | leucocidin S; C-terminus | 124 | AGTGTTCAATGGGGA ATAAAAGCTA [1194] | GATCCTTCTAAATAACTAT TGCCATAGTG [1195] |
| <i>lukS_N</i> | leucocidin S; C-terminus | 123 | AACATTGTCGTTAGG AATAATCACT [1192] | AATCAAAGCATCTTTGTTA TACTTT [1193] |
| <i>NAG</i> | N-acetyl-glucosaminidase; cytotoxin | 125 | ACTCAAACAGTTAGC AAGATTGCTC [1196] | TGCATTTACCCAACCACT GC [1197] |
| <i>nuc</i> | nuclease | 71 | GCGATTGATGGTGAT ACGGTT [1088] | TTTCGCTTGTGCTTCACT TTT [1089] |
| <i>sak</i> | staphylokinase | 126 | CGAGTTATTTTGAACC AACAGGC [1198] | GCGCAAAGATCGAAGTCA CTTAT [1199] |
| <i>sea</i> | staphylococcal enterotoxin A precursor | 127 | CTGATGTTTTTGATGG GAAGGTT [1200] | TGCATGTTTTTCAGAGTTA ATCGTTT [1201] |
| <i>seb</i> | staphylococcal enterotoxin B precursor | 128 | ATATATTCTATTAAGG ACACTAAGTTAGGGA AT [1202] | AGTTAGGTAATCTAATTCT TGAGCAGTCA [1203] |
| <i>sec</i> | staphylococcal enterotoxin C precursor | 129 | GGCACATGATTTAATT TATAACATTAGTG [1204] | ATTCCTAGCTTTTATGTCT AGTTCTTGAG [1205] |
| <i>spa</i> | immunoglobulin G binding protein A precursor | 94 | GGTATTGCATCTGTAA CTTTAGG [1134] | AGGTTAGCACTTTGACTT GG [1135] |
| <i>sprV8</i> | V8 serine protease gene | 137 | ACAAACGCAGTCAAG CAAACA [1220] | CATTGTTGCTGGTTTAAC TACTTCAC [1221] |
| <i>tst</i> | toxic shock syndrome toxin | 138 | AAAATTACCTACTCCA ATAGAACTACCTTT [1222] | TTTCTGCTTCTATAGTTTT TATTTTCATCA [1223] |
| | Antibiotic Resistance Determinants | | | |
| <i>aacA-aphD</i> | bifunctional aminoglycoside modifying enzyme | 843 | ACCCTCATAAAAATAA TCCAAGAGC [2632] | CTTTTTCTTTTGCATAACC TTTTTC [2633] |

| | | | | |
|--------------|--|-----|--|--|
| <i>aadD</i> | aminoglycoside acetyl transferase; kanamycin resistance | 837 | AAGCAGAGTTCAGCC ATGAATG [2620] | CAGATGCGATGATGCAGAC C [2621] |
| <i>aphA3</i> | 3' 5'-aminoglycoside acetyltransferase; kanamycin resistance | 845 | CTGGTGGGAGAAAAT GAAAAC [2636] | CCAGTTTTCGCAATCCAC ATC [2637] |
| <i>blaI</i> | regulator protein | 814 | AGCAAGTTGAAATAT CTATGGCTGA [2574] | TCATTTAAAATGTCTCGCA ATTCTT [2575] |
| <i>blaR</i> | beta lactamase repressor | 790 | GAAAATTCACGTATGT CATGGAATC [2526] | GCATTTTTCCCAGATGGC TT [2527] |
| <i>blaZ</i> | beta-lactamase | 827 | GATAAGAGATTTGCC TATGCTTCAA [2600] | TGCTTAATTTTCCATTTGC GAT [2601] |
| <i>cadA</i> | Probable cadmium-transporting ATPase (Cadmium efflux ATPase) | 897 | TTGGATAGTTCAACAA AAACATTAACA [2740] | CATTTTTATCTTCTGTTAC CACTGGTT [2741] |
| <i>cadC</i> | Cadmium efflux system accessory protein homolog | 908 | TAGCAACCTCCCTTTG ATAC [2762] | ACAAAAGATATGTGTGAA GTTACC [2763] |
| <i>cat</i> | chloramphenicol acetyltransferase | 862 | CCTTCTTTGATTTATG CAATTATGG [2670] | GAAGCATGGTAACCATCA CATACA [2671] |
| <i>dfrA</i> | S1 dihydrofolate reductase; trimethoprim resistance | 859 | ATGACATTATCAATAA TTGTCTGCTCA [2664] | AACATGACCAGATAACTC TTTAATTTTCAAT [2665] |
| <i>ermA</i> | rRNA methylase | 852 | TAGCTATCTTATCGTT GAGAAGGGAT [2650] | AAAGAAATTGTTCTTCG ATAGTTTATT [2651] |
| <i>ermB</i> | adenine methylase | 851 | AACCGATACCGTTTAC GAAATTG [2648] | CGCTTGTAGAATCCTTCT TCAACA [2649] |
| <i>ermC</i> | adenine methylase | 846 | AACACAGTCAAAACTT TATTACTTCAAAAC [2638] | TTGCATAATTTATGGTCTA TTTCAATG [2639] |
| <i>femA</i> | factor essential for methicillin resistance | 801 | TAGGATTTGAACATAC TGGATTCCA [2548] | AAAGGCACTAACACACGG TCTTT [2549] |
| <i>femD</i> | putative factor essential for methicillin resistance | 16 | TCAGGTGAAATGTTA GAATCAGCA [978] | TAAGTCACCAAATAAGAA TGGCG [979] |
| <i>fmhA</i> | similar to Staphylococcus aureus FemA and FemB proteins | 825 | GTTAACGATTGATGA AACGCAAA [2596] | TGCACCATCTTGTTCAATT TGTT [2597] |
| <i>fmhB</i> | essential for addition of glycine 1 to peptidoglycan precursor | 818 | GAGTTATTAAATAGTT TTGAACGCCG [2582] | TTCAGGATGTTCTTTTCT AAAGCT [2583] |
| <i>linA</i> | lincosaminide nucleotidyltransferase | 850 | GATATAGGATACAAA ATAGAAGTTGATTGG [2646] | GGTCTTTTTCTGTTAATTC ATAACCG [2647] |

| | | | | |
|-------------|---|-----|---|---|
| <i>mecA</i> | penicillin binding protein 2' | 802 | ATATGAGATAGGCAT CGTTCCAAA [2550] | CTAATAGATGTGAAGTCG CTTTTCCT [2551] |
| <i>mecI</i> | mecI protein | 812 | TAATAAAACGTATGAA ATATCATCTGCA [2570] | TTTCATCTTGTGATAGATC TTCTTTTTC [2571] |
| <i>mecR</i> | mecI protein | 798 | TTTAAAGAATGGAAC CAAGATCAAA [2542] | TCGCCTTTTAAATGTGTA GCAAA [2543] |
| <i>mreA</i> | ABC transporter | 907 | GCAGTATTAGTACTTG ATGAACCAACG [2760] | GACAAAACGTACAGGATG TCCATAA [2761] |
| <i>mreB</i> | ABC transporter | 36 | ATGAGGTACTCTTTAA TTAGTGGTATCTTGA [1018] | ATCAGCTAATGAAATGAA GATTGCA [1019] |
| <i>mreR</i> | ABC transporter | 37 | GAAAATACAGAACTT GATGGTGAAATG [1020] | GCAAGACTCACATACACC ATAAACTTC [1021] |
| <i>msrA</i> | methionine sulfoxide reductase | 854 | TCATAAGCTGACAGA TTTTCGATCC [2654] | CTTTTAGATGAACCTACA AATCACTTGG [2655] |
| <i>norA</i> | quinolone resistance protein | 904 | TTAGCTTTCATAATGT CAGTTGTATTGA [2754] | ACAGTGTTTCAAATGCCG ATAAA [2755] |
| <i>pbpF</i> | penicillin-binding protein Pbp2b | 42 | AACACAATCGGAAAT GTTGGATAC [1030] | CTATCCCAATCCATAGAC GTGTAA [1031] |
| <i>qacA</i> | quaternary ammonium compound resistance protein | 885 | CAATGGTTACAGGTT GTGGAAGA [2716] | GCCCACTACAGATTCTTC AGCTAC [2717] |
| <i>spc</i> | adenyltransferase AAD9 | 844 | ATATCAGGAAAGATT GGAAATACGG [2634] | AAAGAGGTATAGCCCATT CTGCA [2635] |

In order to obtain a high specificity level, each selected gene was compared to all other gene sequences available in the NCBI database using the BLAST algorithm. From that comparison, regions (ranging from 104 to 1434 bp) devoid of apparent homology with genes of other bacterial species and *Homo sapiens* were defined and amplified by PCR using specifically designed primers (see Tab. 6). A mixture of the total DNA from three different *S. aureus* reference strains and 100 clinical isolates was used as template for amplification of *S. aureus* gene segments, increasing therefore the chances to amplify more seldom occurring virulence and antibiotic resistance genes. PCR products were cloned into the plasmid pCR 2.1-Topo Vector (Invitrogen, Karlsruhe, Germany) which were used to transform competent *Escherichia coli* (XL-1-Blue) cells using the Calcium Chloride protocol (Seidman, C.E. et al., in: Ausubel, F.M. (ed.), Current Protocols in Molecular Biology, John Wiley & Sons, Inc. (2000)). Recombinant plasmids containing selected gene segments were screened by restriction analysis and verified by sequencing. The plasmid library constructed was used for re-amplification and production of the bulk DNA (10 µg at a concentration of 1 µM) from each clone necessary for printing the

microchips. A Microgrid II spotter (BioRobotics, Cambridge, UK) and CMT-GAPS™ coated glass slides (Corning Incorporated, Corning, USA) were used. The complete array of 140 segments of genes was spotted in 3 replicates per slide.

C) DNA purification

5 a) Sample preparation

Bacterial cultures: Overnight cultures (5 ml) were harvested at 2,560g for 10 minutes. After discarding the supernatant the pellet was washed in 1ml TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA) and recovered by centrifugation at 17,900 g for 2 min.

- 10 Blood cultures: One ml of blood culture was mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt blood human cells and resolve bacterial clumps. Bacterial cells were then harvested at 17,900 g for 10 min. Pellets were washed in 1 ml TE and recovered as described above.

b) Purification of DNA

- 15 Pellets of harvested cells were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton®-X-100). To promote bacterial lysis, lysozyme and lysostaphin (Sigma, Taufkirchen, Germany) were added to reach a final concentration of 0.8 mg/ml and 0.2 mg/ml respectively. To lyse Gram negative bacterial cells, only lysozyme in the indicated concentration was used.
- 20 Samples were then incubated for one hour at 37°C. After treatment with Proteinase K (1 mg/ml) (Sigma, Taufkirchen, Germany) for 5 hours at 55°C under mild agitation, the samples were heated at 65°C for 30 min to inactivate Proteinase K and then cooled down to 37°C. Finally, a RNase A treatment (0.2 mg/ml) was carried out for 1 hour at 37°C. A pre-treatment with CTAB
- 25 (Cethyltrimethylammonium bromide) was performed in order to release DNA from polysaccharide DNA complexes (Murray, M.G. and Thopson, W.F., Nucl. Acid Res. 8:4321-4325 (1980)). Salt concentration was adjusted to 0.7 M by adding 5 M NaCl. After thoroughly mixing, a 10% CTAB-0.7M NaCl solution was added to adjust the CTAB concentration to 1%.

The mixture was subsequently incubated under rotation for 20 min at 65°C and then extracted with one volume of chloroform/isoamyl alcohol (24:1). The samples were spun in a microcentrifuge (17,900 g) at room temperature. The aqueous phase was extracted once with chloroform/isoamyl alcohol (24:1), once with
5 phenol/chloroform/isoamyl alcohol (25:24:1) and finally with chloroform/isoamyl alcohol (25:24:1). Genomic DNA in the aqueous phase was sonified (3 x 10 s at 12% amplitude with 20 s breaks between pulses) in a Digital Sonifier (Branson, Schwaebisch Gmuend, Germany) to obtain fragments of around 1 kb, then precipitated with one volume of isopropanol and pelleted by centrifugation for 30
10 min at 4°C in a microcentrifuge at 17,900 g. The pellets were washed in 70% ethanol and resuspended in 50-100 µl TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA). This DNA preparation was used when a high yield (hundreds of µg) was necessary, for example to prepare samples for several hybridisations experiments.

A second protocol using DNeasy Tissue Kit (QIAGEN, Hilden, Germany) adapted to
15 bacterial cells and allowing DNA preparation in two hours, was also used when fast preparation was the priority. The abbreviations below pertain to the manufacturer's abbreviations for buffers used in the kit. The bacterial pellet was resuspended in 1 ml ddH₂O and the cell suspension frozen in liquid N₂ for 1 minute and then placed in a 60° C thermo-block for 2 minutes. Such a treatment was repeated once and
20 bacteria were centrifuged again for 5 minutes at 14,000g. The resulting pellet was resuspended in 180 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton-X-100). Specifically for *S. aureus* DNA preparation, lysostaphin (0.2mg/ml) was added and incubated 1 hour at 37°C. After, 200 µl of buffer AL (for gram positive bacteria) or buffer ATL (for gram negative) and 25 µl of the
25 Proteinase K solution delivered with the kit were added and incubated at 70°C for 30 minutes. 200 µl of 100% ethanol were added and the suspension transferred to a DNeasy Mini Column placed into a collection tube. The column was centrifuged at 6,000 g for 1 minute, washed first with 500 µl of buffer AW1, centrifuged at 6,000 g for 1 minute, washed then with 500 µl of buffer AW2, and centrifuged at 14,000 g
30 for 3 minutes. The column was then placed in a 1.5 ml tube and centrifuged once more at 14,000 g for 1 minute. DNA was eluted with 130 µl of buffer AE. After one minute the column was centrifuged at 6,000g for 1 minute. The eluate was re-

loaded in the column and centrifuged again under the same conditions in order to increase the DNA yield.

D) DNA labelling

Different amounts of DNA (5 ng to 5 µg) were labelled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50units) (both from BioPrime DNA labelling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and the probe purified either by MiniElute PCR or QIAquick Purification Kits (QIAGEN, Hilden, Germany), depending on the amount of labelled DNA applying two wash and two elution steps.

E) Hybridisation and detection procedure

All experiments described in the present example represent co-hybridisation of two different DNA samples labelled respectively with Cy3 and Cy5. Cy3 and Cy5 belong to the cyanine family of fluorophores and were used as reporter molecules. The photochemical properties of the two CyDye fluors were as follows: Absorption maximum at 550 nm and emission maximum at 570 nm for Cy3 and for Cy5 at 649 nm and 670 nm, respectively.

After purification, Cy3 and Cy5 labelled DNA were pooled and 10 µg of Salmon Sperm DNA and 50 µg of polyA DNA were added. The mixture was frozen in liquid nitrogen and lyophilized in the dark. DNA microchips were automatically hybridised in a GeneTac Hybridisation Station (Genomic Solutions, Harvard, USA) following the Corning protocol.

Shortly, 110 µl of pre-hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS, 10 mg/ml BSA) were added to each slide and incubated for one hour at 42°C. Lyophilized samples were resuspended in 110µl of hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS), denatured for 3 minutes at 90°C, added to the slides, and incubated 4 hours at 42°C. After several washing steps using successively 2 x SSC/0.1% SDS, 0.1 x SSC/0.1% SDS, and 0.1 x SSC, slides were

dried by a 2 min centrifugation step (1000 g) and read in a Scan Array 5000 (Perkin Elmer, Boston, USA) using emission filters for Cy3 and Cy5 in two separate channels. Fluorescence intensities as hybridisation indicators were then analyzed by the software ImaGene (BioDiscovery, Marina Del Rey, USA). Spots were found and segmented in order to select areas of recognizable signals for analysis. Intensity of fluorescence of each spot was measured, signal to local background ratios were calculated, spot morphology and deviation from expected spot position were considered. Cut off values for those parameters were empirically determined in pilot experiments and used to tag spots either as positive or as negative.

10 F) Validation of the detection system

The experimental approach adopted in present example required dual-dye hybridisations. It was therefore necessary to verify at first whether DNA samples from the same source, labelled with one or the other fluorochrome, would produce the same hybridisation pattern. Co-hybridisation experiments, combining two identical samples of 2 µg of *S. aureus* DNA, produced strictly similar hybridisation results whatever fluorochrome was used for labelling (Fig. 2A). For better presentation gray scale images from scanning were converted in false-colour, where green and red colour represent intensity of Cy3 and Cy5 fluorochromes respectively. All spots showed double-hybridisation - yellow colour meaning the overlay between green (here assigned to Cy3 labelled DNA) and red signals (Cy5 labelled DNA). Signal intensities from both channels strongly correlated ($r^2=0,97$) (Fig. 2B).

G) Sensitivity of detection

S. aureus DNA samples in decreasing amounts (from 2 µg to 5 ng) were labelled and hybridised in order to determine the minimum amount of DNA producing the expected hybridisation pattern for a certain strain. Such expected patterns were defined as those produced by the hybridisation of 2 µg of DNA. From 2 µg to 50 ng no significant differences in the hybridisation pattern were observed with no false negative spots. Detection of 20 ng DNA was still satisfying with only 5% of false negative and false positive. However, 5 ng of labelled DNA yielded weak signals with almost 95% of false negative spots (data not shown). The limit of sensitivity of the *S. aureus* microarray was then considered as being 20 ng DNA which

corresponds approximately to 7×10^6 *S. aureus* CFU (*S. aureus* genome 2.5×10^6 bp. 2.8 fg DNA per cell).

H) Specificity of detection

5 The specificity of the *S. aureus* microchip was demonstrated by six independently performed co-hybridisation experiments. Visual examination of pictures showing results of co-hybridisation of *S. aureus* DNA with *Pseudomonas aeruginosa* or *Escherichia coli* DNA revealed no cross-hybridisation between *S. aureus* selected gene segments and DNA probes from those Gram negative bacteria (data not shown). Transcribing these data in a bar code showing positive or negative spots
10 (Fig. 3A and B) confirmed that only the *S. aureus* DNA sample hybridised with spotted probes.

The specificity of the microarray could be demonstrated even below the genus level. As shown in Fig. 4, some spotted *S. aureus* probes cross-hybridised with *S. epidermidis* and *S. saprophyticus* DNA samples. This is not surprising as these
15 species are phylogenetically closely related. However, genes coding for *S. aureus* specific proteins as nuclease (*nuc*), clumping factors A and B (*clfA* and *B*), protein A (*spa*), V8 serine protease (*sprV8*) and alpha and beta hemolysins (*hla* and *hlb*) exclusively hybridised with *S. aureus* DNA. The presence/absence of such genes allowed unambiguous discrimination between *S. aureus* and CoNS.

20 I) *S. aureus* strain profiling

The principle of the *S. aureus* microarray was tested as a tool for strain profiling. A distinctive hybridisation pattern could be established for reference strains and
25 10 selected clinical isolates. For instance when DNA from clinical isolates T100 and T103 were labelled with Cy5 and Cy3, respectively, and co-hybridised, both isolates were identified as *S. aureus*, since both contained species-specific genes as e.g. clumping factor A and B (Fig. 5A).

Moreover, both strains are methicillin resistant (*mecA* positive), but only T100 contained the beta-lactamase gene. The hybridisation of T103 DNA reveals the presence of *ermA*, *ermB* and *aacA* genes indicating that the strain is resistant to
30 erythromycin and aminoglycosides.

Apparently, T103 harbors the genes encoding enterotoxines A (*eta*) and B (*etb*) while in T100 the gene encoding enterotoxin C (*etc*) is present. The presence or absence of these genes was confirmed by PCR assays (Fig. 5B) and the antibiotic resistance was verified by classical antibiograms (Sahm, D. & Washington, J. A. (1991). Antibacterial susceptibility tests: dilution methods. In: Manual of Clinical Microbiology (Balows, A., Ed.), pp. 1105–16. American Society for Microbiology, Washington DC, USA) (data not shown).

J) Detection of *S. aureus* in spiked positive BACTEC® cultures

One possible application of the *S. aureus* microarray is to detect the bacterium growing in blood culture, i.e. after the BACTEC® signals bacterial growth. Blood culture bottles were spiked with 100 CFU of *S. aureus*. After the automated culturing system indicated bacterial growth, 1 ml was withdrawn for DNA extraction.

As shown in Fig. 6A, DNA samples prepared from sterile blood culture show no crosshybridisation with spotted *S. aureus* probes. A 2 µg DNA sample derived from blood culture containing *S. aureus* cells revealed a hybridisation pattern almost completely identical to a DNA sample isolated from an overnight LB culture inoculated with a *S. aureus* colony (Fig. 6B).

These data underscore the high sensitivity and specificity of the detection system since blood culture DNA comprises a mixture of human and bacterial DNA. Co-hybridisation between DNA from blood culture positive for *S. aureus* and CoNS DNA also allowed clear identification since only the *S. aureus* probe hybridised to *S. aureus* species-specific genes (data not shown).

K) Detection of *S. aureus* in positive BACTEC® cultures inoculated with clinical specimens

Co-hybridisation with DNA from clinical blood cultures positive for *S. aureus* and CoNS (*Staphylococcus epidermidis*), *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca* allowed clear species identification since the *S. aureus* probes hybridised to *S. aureus* species-specific genes only. *Staphylococcus epidermidis* positive blood culture DNA hybridised to staphylococcal metabolic genes and to some antibiotic

resistance determinant genes only. No cross-hybridisation was detected between DNA from the two gram-negative strains and the *Streptococcus* strain and *S. aureus* spotted gene probes (data not shown).

Example 2.1: Materials and Methods

5 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany), the Collection Institute Pasteur (CIP, Paris, France) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA,
10 Herndon, Virginia). *Klebsiella pneumoniae* serotype O3 and serotype O8 were provided by E.M. Nielsen (Department of Bacteriology, Mycology and Parasitology, Statens Serum Institut, Copenhagen, Denmark). Clinical isolates were obtained from the inventors' clinical routine microbiology laboratory.

The following bacteria and fungi were used for evaluation of the specificity of the
15 microarray: *Acinetobacter baumannii* (DSM 30008, 1 clinical isolate), *Pseudomonas aeruginosa* (ATCC27853), *Escherichia coli* (ATCC 25922, CIP 105893, 81.88, 74.14 and 3 clinical isolates), *Klebsiella oxytoca* (DSM 4798, 1 clinical isolate), *Klebsiella pneumoniae* (DSM 681, serotype O3 strain 390 and serotype O8 strain 889), *Proteus mirabilis* (DSM 788, 2 clinical isolates), *Proteus vulgaris* (DSM 2140),
20 *Candida albicans* (ATCC 10231), *Enterococcus casseliflavus* (clinical isolate), *Enterococcus faecalis* (ATCC 29212, 1 clinical isolate), *Enterococcus faecium* (clinical isolate), *Enterococcus gallinarum* (clinical isolate), *Streptococcus agalactiae* (DSM 2134), *Streptococcus angiosus* (DSM 20563), *Streptococcus bovis* (DSM 20480), *Streptococcus dysgalactiae* (DSM 20662), *Streptococcus gordonii* (DSM
25 6777), *Streptococcus mutans* (DSM 20523), *Streptococcus pneumoniae* (ATCC 49619), *Streptococcus pyogenes* (DSM 11723), *Staphylococcus aureus* (ATCC 29213, NRS123 alias MW2, 2 clinical isolates), *Staphylococcus epidermidis* (ATCC 12228, 1 clinical isolates), *Staphylococcus haemolyticus* (DSM 20263), *Staphylococcus hominis* (DSM 20228), *Staphylococcus lugdunensis* (DSM 4804),
30 *Staphylococcus saprophyticus* (ATCC 14953) and *Staphylococcus warneri* (DSM 20316).

Bacterial and fungal reference strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth

(TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Example 2.2: DNA preparation

For microarray hybridization experiments, DNA was prepared from the strains listed in Example 2.1.

Total cellular DNA was extracted and purified by using the Bacterial Genomic DNS Purification Kit (Edge BioSystems, Gaithersburg, USA). Cell pellets were resuspended in 200 µl lysis buffer (20 mM Tris-HCl, pH 7.5, 50 mM NaCl and 10 mM EDTA, pH 8.0) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 7.5 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote Staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, 400 µl Sphaeroblast buffer were added and DNA was extracted following the instructions of the supplier.

Candida albicans DNA was extracted using the MasterPure Yeast DNA purification kit (Epicentre Biotechnologies, Madison USA) following the instructions of the manufacturer.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 2.3: DNA labelling

Prior to labelling, high molecular weight DNA (≥ 12 kb) was fragmented by sonication for 30 sec at an amplitude of 80% (energy input 1500 kJ) using an ultrasonic homogenizer (Sonoplus HD 3080, Bandelin, Berlin, Germany) equipped with a BR30 booster cup for high-intensive irradiation of small and sensitive sample volumes. The size of the fragmented DNA (500-8000 bp) was checked by 1.5% agarose gel electrophoresis. Different amounts of DNA (1 to 5 µg) were then labeled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech

Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50 units) (both from BioPrime DNA labeling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. Prior to

5 labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and unbound label was removed using the QIAquick Purification Kit (QIAGEN, Hilden, Germany). The purified labelled DNA was eluted in

10 80 µl TE and the relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-

15 spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 2.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All

20 together 930 gene segments ("probes") were represented on the microarray (Tab. 7). They comprised probes for virulence genes, species specific metabolic and structural genes from *Candida albicans* (86), *Acinetobacter baumannii* (21), *Enterobacter cloacae* (11), *Escherichia coli* (31), *Enterococcus faecalis* (69), *E. faecium* (23), *Klebsiella oxytoca* (21), *K. pneumoniae* (50), *P. aeruginosa* (53),

25 *Proteus mirabilis* (70), *P. vulgaris* (9), *Stenotrophomonas maltophilia* (13), *Streptococcus agalactiae* (38), *S. dysgalactiae* (1), *S. pneumoniae* (83), *S. pyogenes* (42), *S. viridans* (19, including probes for *S. mutans* and *S. bovis*), Streptococci (2), *Staphylococcus aureus* (69), *S. epidermidis* (35), *S. haemolyticus* (7), *S. hominis* (1), *S. lugdunensis* (6), *S. saprophyticus* (2) and *S. warneri* (7), as

30 well as for bacterial antibiotic resistant determinants (131), and positive and negative controls (29).

Tab. 7: Gene probes on array of example 2.

| n | Probe Name | SeqID |
|---|------------|-------|
|---|------------|-------|

| n | Probe Name | SeqID |
|----|------------------------|-------|
| 1 | 16SKpn_1_1 | 934 |
| 2 | 16SrRNAPrmi_1_1 | 940 |
| 3 | 16SRNAEf_1_1 | 936 |
| 4 | 16SRNAEf_2_1 | 933 |
| 5 | 16SShaemolyt_1_1 | 938 |
| 6 | 16SShominis_1_1 | 937 |
| 7 | 16SStrepagalactiae_1_1 | 930 |
| 8 | 16SPa_1_1 | 926 |
| 9 | 16SSa_1_1 | 942 |
| 10 | 16SSa_3_1 | 935 |
| 11 | 16SStrepneu_1_1 | 929 |
| 12 | 16SStrepyog_1_1 | 928 |
| 13 | 16SKlox_1_1 | 943 |
| 14 | 16SrRNAPrvu1_1_1 | 941 |
| 15 | 16SEfaecium_1_1 | 931 |
| 16 | 16SEfaecium_2_1 | 932 |
| 17 | 23SEfaecium_1_1 | 939 |
| 18 | 23SEfaecium_2_1 | 927 |
| 19 | ARHGDIa(hu)_1_1 | 923 |
| 20 | b-Act(hu)_1_1 | 922 |
| 21 | GAPD(hu)_1_1 | 921 |
| 22 | LDHA(hu)_1_1 | 920 |
| 23 | PGK1(hu)_1_1 | 924 |
| 24 | rbcL_1_1 | 919 |
| 25 | rbcL_1_2 | 925 |
| 26 | aac(6p)-lb7_1_1 | 2867 |
| 27 | aacA-aphD_1_1 | 843 |
| 28 | aacA4ENCL_1_1 | 2864 |
| 29 | aacC2_1_1 | 833 |
| 30 | aadB_1_2 | 836 |
| 31 | aadD_1_1 | 837 |
| 32 | adeA-ACIBA_1_1 | 2866 |
| 33 | adeB-ACIBA_1_1 | 2868 |
| 34 | adeC-ACIBA_1_1 | 2869 |
| 35 | AdeR-ACIBA_1_1 | 2865 |
| 36 | AdeS-ACIBA_1_1 | 2870 |
| 37 | aph-A3_1_1 | 840 |
| 38 | strA_1_1 | 839 |
| 39 | strB_1_1 | 834 |
| 40 | aacA_aphDStwar_1_1 | 831 |
| 41 | aacA4_1_1 | 842 |
| 42 | aacA4_1_2 | 838 |
| 43 | aacC1_1_1 | 841 |
| 44 | aacC1_1_2 | 832 |
| 45 | aadA_1_1 | 835 |
| 46 | aphA3_1_1 | 845 |

| n | Probe Name | SeqID |
|----|-------------------|-------|
| 47 | ampC-ENCL_1_1 | 2874 |
| 48 | ampC_1_1 | 789 |
| 49 | ampR_1_1 | 2873 |
| 50 | blaA_1_1 | 823 |
| 51 | blaB_1_1 | 788 |
| 52 | blaShaemolyt_1_1 | 803 |
| 53 | blaL1_1_1 | 2875 |
| 54 | blaL2_1_1 | 2871 |
| 55 | blaMIR-3_1_1 | 2872 |
| 56 | blaOXA-1_1_1 | 828 |
| 57 | blaOXY-KLOX_1_1 | 816 |
| 58 | blaSHV-1_1_1 | 794 |
| 59 | blaTEM-106_1_1 | 815 |
| 60 | blavim_1_1 | 804 |
| 61 | blaZ_1_1 | 827 |
| 62 | cumA_1_1 | 819 |
| 63 | femA_1_1 | 801 |
| 64 | femBShaemolyt_1_1 | 820 |
| 65 | fmhA_1_1 | 825 |
| 66 | fmhB_1_1 | 818 |
| 67 | ftsWEF_1_1 | 817 |
| 68 | mecA_1_1 | 802 |
| 69 | mecISepid_1_1 | 786 |
| 70 | pbp1a_1_1 | 813 |
| 71 | pbp2aStrpneu_1_1 | 793 |
| 72 | pbp2x_1_1 | 807 |
| 73 | pbp3Saureuc_1_1 | 808 |
| 74 | pbp4_1_1 | 809 |
| 75 | pbp5Efaecium_1_1 | 810 |
| 76 | pbpC_1_1 | 811 |
| 77 | psrb_1_1 | 824 |
| 78 | bla-CTX-M-22_1_1 | 792 |
| 79 | bla_FOX-3_1_1 | 822 |
| 80 | blaIMP-7_1_1 | 785 |
| 81 | blaIMP-7_1_2 | 797 |
| 82 | blaOXA-10_1_2 | 787 |
| 83 | blaOXA-2_1_1 | 795 |
| 84 | blaOXA-32_1_1 | 791 |
| 85 | blaOXY_1_1 | 799 |
| 86 | blaPER-1_1_1 | 821 |
| 87 | blaPrmi_1_1 | 830 |
| 88 | blaRShaemolyt_1_1 | 796 |
| 89 | dacCStrpyog_1_1 | 800 |
| 90 | fox-6_1_1 | 829 |
| 91 | mecR1Sepid_1_1 | 826 |
| 92 | pbp2b_1_1 | 805 |

| n | Probe Name | SeqID |
|-----|--------------------|-------|
| 93 | pbp2primeSepid_1_1 | 806 |
| 94 | cat_1_1 | 862 |
| 95 | catEfaecium_1_1 | 861 |
| 96 | cmlA5_1_1 | 860 |
| 97 | ble_1_1 | 875 |
| 98 | ddl_1_1 | 874 |
| 99 | vanRB2_1_1 | 870 |
| 100 | vanSB2_1_1 | 872 |
| 101 | vanWB2_1_1 | 873 |
| 102 | vanXB2_1_1 | 876 |
| 103 | vanA_1_1 | 867 |
| 104 | vanB_1_1 | 879 |
| 105 | vanC-2_1_1 | 881 |
| 106 | vanH(tn)_1_1 | 866 |
| 107 | vanHB2_1_1 | 868 |
| 108 | vanR_1_1 | 869 |
| 109 | vanS(tn)_1_1 | 871 |
| 110 | vanX(tn)_1_1 | 882 |
| 111 | vanY(tn)_1_1 | 877 |
| 112 | vanYB2_1_1 | 878 |
| 113 | vanZ(tn)_1_1 | 880 |
| 114 | ermA_1_1 | 852 |
| 115 | ermB_1_2 | 851 |
| 116 | ermC_1_1 | 846 |
| 117 | linB_1_1 | 847 |
| 118 | mdrSA_1_1 | 849 |
| 119 | mefA_1_1 | 856 |
| 120 | mphBM_1_1 | 855 |
| 121 | mrX_1_1 | 857 |
| 122 | msrA_1_1 | 854 |
| 123 | satA_1_1 | 853 |
| 124 | satSA_1_1 | 848 |
| 125 | abcXStrpmut_1_1 | 894 |
| 126 | acrA_1_1 | 892 |
| 127 | acrB_1_1 | 883 |
| 128 | acrR_1_1 | 890 |
| 129 | albA_1_1 | 898 |
| 130 | arr2_1_1 | 906 |
| 131 | cadBStalugd_1_1 | 888 |
| 132 | elkT-abcA_1_1 | 896 |
| 133 | emeA_1_1 | 891 |
| 134 | mexA_1_1 | 889 |
| 135 | mexB_1_2 | 884 |
| 136 | mexR_1_1 | 905 |
| 137 | mreA_1_1 | 907 |
| 138 | norA23_1_1 | 904 |

| n | Probe Name | SeqID |
|-----|----------------|-------|
| 139 | nov_1_1 | 901 |
| 140 | qacEdelta1_1_1 | 895 |
| 141 | rtn_1_1 | 893 |
| 142 | sul_1_1 | 887 |
| 143 | sull_1_1 | 886 |
| 144 | sulll_1_1 | 2888 |
| 145 | wbbl_1_1 | 903 |
| 146 | wzm_1_1 | 899 |
| 147 | wzt_1_1 | 902 |
| 148 | msrCb_1_1 | 900 |
| 149 | uvrA_1_1 | 909 |
| 150 | tetA-ACIBA_1_1 | 2907 |
| 151 | tetAJ_1_1 | 863 |
| 152 | tetL_1_1 | 864 |
| 153 | tetM_1_1 | 865 |
| 154 | tetR-ACIBA_1_1 | 2908 |
| 155 | dfrA_1_1 | 859 |
| 156 | dfrStrpneu_1_1 | 858 |
| 157 | AAF1_1_1 | 247 |
| 158 | ALS1_1_1 | 249 |
| 159 | ALS7_1_1 | 250 |
| 160 | ASL43f_1_1 | 232 |
| 161 | BGL2_1_1 | 233 |
| 162 | CACHS3_1_1 | 234 |
| 163 | CEF3_1_1 | 237 |
| 164 | CHS1_1_1 | 238 |
| 165 | CHS2_1_1 | 239 |
| 166 | CHS4_1_1 | 240 |
| 167 | CHS5_1_1 | 241 |
| 168 | CHT1_1_1 | 242 |
| 169 | CHT2_1_1 | 243 |
| 170 | CHT4_1_1 | 244 |
| 171 | CSA1_1_1 | 245 |
| 172 | GSC1_1_1 | 257 |
| 173 | GSL1_1_1 | 258 |
| 174 | HWP1_2_1 | 261 |
| 175 | HYR1_1_1 | 262 |
| 176 | INT1a_1_1 | 263 |
| 177 | KRE15f_1_1 | 264 |
| 178 | KRE6_1_1 | 265 |
| 179 | KRE9_1_1 | 266 |
| 180 | MP65_1_1 | 269 |
| 181 | PHR1_1_1 | 272 |
| 182 | PHR2_1_1 | 273 |
| 183 | PHR3_1_1 | 274 |
| 184 | PRA1_1_1 | 275 |

| n | Probe Name | SeqID |
|-----|---------------------|-------|
| 185 | RBT1_1_1 | 277 |
| 186 | RBT4_1_1 | 278 |
| 187 | RHO1_1_1 | 279 |
| 188 | RVS167_1_1 | 283 |
| 189 | SKN1_1_1 | 285 |
| 190 | TCA1_1_1 | 287 |
| 191 | YAE1_1_1 | 289 |
| 192 | CDR1_1_1 | 911 |
| 193 | CDR1_2_1 | 912 |
| 194 | CRD2_1_1 | 910 |
| 195 | ERG11_1_1 | 917 |
| 196 | FET3_1_1 | 914 |
| 197 | FTR2_1_1 | 915 |
| 198 | MDR1-7_1_1 | 916 |
| 199 | MET3_1_1 | 913 |
| 200 | SEC20_1_1 | 918 |
| 201 | ADH1_1_1 | 248 |
| 202 | ARG56_1_1 | 231 |
| 203 | ESS1_1_1 | 253 |
| 204 | GAP1_1_1 | 255 |
| 205 | GNA1_1_1 | 256 |
| 206 | HIS1_1_1 | 259 |
| 207 | MLS1_1_1 | 268 |
| 208 | NDE1_1_1 | 270 |
| 209 | PFK2_1_1 | 271 |
| 210 | SRB1_1_1 | 286 |
| 211 | TRP1_1_1 | 288 |
| 212 | YRB1_1_1 | 290 |
| 213 | 5triphosphatase_1_1 | 246 |
| 214 | CCT8_1_1 | 235 |
| 215 | CDC37_1_1 | 236 |
| 216 | EDT1_1_1 | 251 |
| 217 | ELF_1_1 | 252 |
| 218 | FAL1_1_1 | 254 |
| 219 | HTS1_1_1 | 260 |
| 220 | MIG1_1_1 | 267 |
| 221 | PRS1_1_1 | 276 |
| 222 | RNR1_1_1 | 280 |
| 223 | RPB7_1_1 | 281 |
| 224 | RPL13_1_1 | 282 |
| 225 | SHA3_1_1 | 284 |
| 226 | YST1exon2_1_1 | 291 |
| 227 | CCN1_1_1 | 292 |
| 228 | CDC28_1_1 | 293 |
| 229 | CLN2_1_1 | 294 |
| 230 | CPH1_1_1 | 295 |

| n | Probe Name | SeqID |
|-----|----------------|-------|
| 231 | CYB1_1_1 | 296 |
| 232 | EFG1_1_1 | 297 |
| 233 | MNT1_1_1 | 298 |
| 234 | RBF1_1_1 | 299 |
| 235 | RBF1_2_1 | 300 |
| 236 | RIM101_1_1 | 301 |
| 237 | RIM8_1_1 | 302 |
| 238 | SEC14_1_1 | 303 |
| 239 | SEC4_1_1 | 304 |
| 240 | TUP1_1_1 | 305 |
| 241 | YPT1_1_1 | 306 |
| 242 | ZNF1CZF1_2_1 | 307 |
| 243 | carO_1_1 | 2843 |
| 244 | csuA_1_1 | 2854 |
| 245 | csuA_B_1_1 | 2853 |
| 246 | csuB_1_1 | 2852 |
| 247 | csuC_1_1 | 2849 |
| 248 | csuD_1_1 | 2848 |
| 249 | dhbA_1_1 | 2845 |
| 250 | dhbB_1_1 | 2846 |
| 251 | gacS_1_1 | 2844 |
| 252 | sid_1_1 | 2847 |
| 253 | tnp-ACIBA_1_1 | 2850 |
| 254 | waaA-ACIBA_1_1 | 2851 |
| 255 | abc_1_1 | 2857 |
| 256 | cysI_1_1 | 2860 |
| 257 | dec_1_1 | 2859 |
| 258 | furACIBA_1_1 | 2858 |
| 259 | ompA-ACIBA_1_1 | 2863 |
| 260 | por_1_1 | 2856 |
| 261 | put1_1_1 | 2855 |
| 262 | put3_1_1 | 2862 |
| 263 | trpE_1_1 | 2861 |
| 264 | asr_1_1 | 2876 |
| 265 | ehuA_1_1 | 2885 |
| 266 | ehuS_1_1 | 2878 |
| 267 | ehuT_1_1 | 2883 |
| 268 | ehuU_1_1 | 2882 |
| 269 | ehuV_1_1 | 2879 |
| 270 | lacZ_1_1 | 2877 |
| 271 | ORF165_1_1 | 2881 |
| 272 | ORF295_1_1 | 2884 |
| 273 | ORF400_1_1 | 2886 |
| 274 | slyA_1_1 | 2880 |
| 275 | b1169_1_1 | 142 |
| 276 | envZ_1_1 | 143 |

| n | Probe Name | SeqID |
|-----|---------------|-------|
| 277 | fliCb_1_1 | 144 |
| 278 | nfrB_1_1 | 145 |
| 279 | nlpA_1_1 | 146 |
| 280 | pilAe_1_1 | 147 |
| 281 | yacH_1_1 | 148 |
| 282 | yagX_1_1 | 149 |
| 283 | ycdS_1_1 | 150 |
| 284 | yciQ_1_1 | 151 |
| 285 | ymcA_1_1 | 152 |
| 286 | b1202_1_1 | 153 |
| 287 | eae_1_1 | 154 |
| 288 | eltB_1_1 | 155 |
| 289 | escR_1_1 | 156 |
| 290 | escT_1_1 | 157 |
| 291 | escU_1_1 | 158 |
| 292 | espB_1_1 | 159 |
| 293 | fes_1_1 | 160 |
| 294 | fes_2_1 | 161 |
| 295 | fteA_1_1 | 162 |
| 296 | hlyA_1_1 | 163 |
| 297 | hlyB_1_1 | 164 |
| 298 | iucA_1_1 | 165 |
| 299 | iucB_1_1 | 166 |
| 300 | iucC_1_1 | 167 |
| 301 | papG_1_1 | 168 |
| 302 | rfbE_1_1 | 169 |
| 303 | shuA_1_1 | 170 |
| 304 | SLTII_1_1 | 171 |
| 305 | toxA-LTPA_1_1 | 172 |
| 306 | VT2vaB_1_1 | 173 |
| 307 | ABC-eltA_1_1 | 317 |
| 308 | agrBfs_1_1 | 318 |
| 309 | agrCfs_1_1 | 319 |
| 310 | arcA_1_1 | 308 |
| 311 | arcC_1_1 | 309 |
| 312 | bkdA_1_1 | 310 |
| 313 | cad_1_1 | 311 |
| 314 | camE1_1_1 | 312 |
| 315 | csrA_1_1 | 313 |
| 316 | dacA_1_1 | 314 |
| 317 | dfr_1_1 | 315 |
| 318 | dhoD1a_1_1 | 316 |
| 319 | dnaE_1_1 | 320 |
| 320 | ebsA_1_1 | 321 |
| 321 | ebsB_1_1 | 322 |
| 322 | eep_1_1 | 323 |

| n | Probe Name | SeqID |
|-----|----------------|-------|
| 323 | efaR_1_1 | 324 |
| 324 | gls24_glsB_1_1 | 325 |
| 325 | gph_1_1 | 326 |
| 326 | gyrAEf_1_1 | 327 |
| 327 | metEf_1_1 | 328 |
| 328 | mntHCb2_1_1 | 329 |
| 329 | mob2_1_1 | 330 |
| 330 | mvaD_1_1 | 331 |
| 331 | mvaE_1_1 | 332 |
| 332 | parC_1_1 | 333 |
| 333 | pcfG_1_1 | 334 |
| 334 | phoZ_1_1 | 335 |
| 335 | polC_1_1 | 336 |
| 336 | ptb_1_1 | 337 |
| 337 | recS1_1_1 | 338 |
| 338 | rpoN_1_1 | 339 |
| 339 | tms_1_1 | 340 |
| 340 | tyrDC_1_1 | 341 |
| 341 | tyrS_1_1 | 342 |
| 342 | ace_1_1 | 351 |
| 343 | asa1_1_1 | 343 |
| 344 | asp1_1_1 | 344 |
| 345 | cgh_1_1 | 345 |
| 346 | cylA_1_1 | 346 |
| 347 | cylB_1_1 | 347 |
| 348 | cylI_1_1 | 348 |
| 349 | cylL_cylS_1_1 | 349 |
| 350 | cylM_1_1 | 350 |
| 351 | ef00108_1_1 | 352 |
| 352 | ef00109_1_1 | 353 |
| 353 | ef0011_1_1 | 354 |
| 354 | ef00113_1_1 | 355 |
| 355 | ef0012_1_1 | 356 |
| 356 | ef0022_1_1 | 357 |
| 357 | ef0031_1_1 | 358 |
| 358 | ef0032_1_1 | 359 |
| 359 | ef0040_1_1 | 360 |
| 360 | ef0058_1_1 | 361 |
| 361 | enlA_1_1 | 362 |
| 362 | esa_1_1 | 363 |
| 363 | esp_1_1 | 364 |
| 364 | gelE_1_1 | 365 |
| 365 | groEL_1_1 | 366 |
| 366 | groES_1_1 | 367 |
| 367 | rt1_1_1 | 368 |
| 368 | sala_1_1 | 369 |

| n | Probe Name | SeqID |
|-----|---------------------|-------|
| 369 | salb_1_1 | 370 |
| 370 | sea1_1_1 | 371 |
| 371 | sep1_1_1 | 372 |
| 372 | vicK_1_1 | 373 |
| 373 | yycH_1_1 | 374 |
| 374 | yycI_1_1 | 375 |
| 375 | yycJ_1_1 | 376 |
| 376 | bglB_1_1 | 377 |
| 377 | bglR_1_1 | 378 |
| 378 | bglS_1_1 | 379 |
| 379 | efmA_1_1 | 380 |
| 380 | efmB_1_1 | 381 |
| 381 | efmC_1_1 | 382 |
| 382 | mreC_1_1 | 383 |
| 383 | mreD_1_1 | 384 |
| 384 | mvaDEfaecium_1_1 | 385 |
| 385 | mvaEEfaecium_1_1 | 386 |
| 386 | mvaK1Efaecium_1_1 | 387 |
| 387 | mvaK2Efaecium_1_1 | 388 |
| 388 | mvaSEfaecium_1_1 | 389 |
| 389 | orf3_4Efaeciumb_1_1 | 390 |
| 390 | orf6_7Efaecium_1_1 | 391 |
| 391 | orf7_8Efaecium_1_1 | 392 |
| 392 | orf9_10Efaecium_1_1 | 393 |
| 393 | entA_entI_1_1 | 394 |
| 394 | entD_1_1 | 395 |
| 395 | entR_1_1 | 396 |
| 396 | oep_1_1 | 397 |
| 397 | sagA_1_2 | 398 |
| 398 | H+ATPase_1_1 | 2887 |
| 399 | cymA_1_1 | 449 |
| 400 | cymD_1_1 | 450 |
| 401 | cymE_1_1 | 451 |
| 402 | cymH_1_1 | 452 |
| 403 | cymI_1_1 | 453 |
| 404 | cymJ_1_1 | 454 |
| 405 | ddrA_1_1 | 455 |
| 406 | fdt-1_1_1 | 456 |
| 407 | fdt-2_1_1 | 457 |
| 408 | fdt-3_1_1 | 458 |
| 409 | gatY_1_1 | 459 |
| 410 | hydH_1_1 | 460 |
| 411 | masA_1_1 | 461 |
| 412 | nasA_1_1 | 462 |
| 413 | nasE_1_1 | 463 |
| 414 | nasF_1_1 | 464 |

| n | Probe Name | SeqID |
|-----|-------------|-------|
| 415 | pehX_1_1 | 465 |
| 416 | pelX_1_1 | 466 |
| 417 | tagH_1_1 | 467 |
| 418 | tagK_1_1 | 468 |
| 419 | tagT_1_1 | 469 |
| 420 | acoA_1_1 | 408 |
| 421 | acoB_1_1 | 409 |
| 422 | acoC_1_1 | 410 |
| 423 | ahlK_1_1 | 411 |
| 424 | atsA_1_1 | 399 |
| 425 | atsB_1_1 | 400 |
| 426 | budC_1_1 | 401 |
| 427 | citA_1_1 | 402 |
| 428 | citW_1_1 | 403 |
| 429 | citX_1_1 | 404 |
| 430 | dalD_1_1 | 405 |
| 431 | dalK_1_1 | 406 |
| 432 | dalT_1_1 | 407 |
| 433 | fimK_1_1 | 412 |
| 434 | glfKPN2_1_1 | 413 |
| 435 | liac_1_1 | 431 |
| 436 | ltrA_1_1 | 414 |
| 437 | mdcC_1_1 | 415 |
| 438 | mdcF_1_1 | 416 |
| 439 | mdcH_1_1 | 417 |
| 440 | mrkA_1_1 | 418 |
| 441 | mtrK_1_1 | 419 |
| 442 | nifF_1_1 | 420 |
| 443 | nifK_1_1 | 421 |
| 444 | nifN_1_1 | 422 |
| 445 | tyrP_1_1 | 423 |
| 446 | ureA_1_1 | 424 |
| 447 | wbbO_1_1 | 425 |
| 448 | wza_1_1 | 426 |
| 449 | wzb_1_1 | 427 |
| 450 | wzmKPN2_1_1 | 428 |
| 451 | wztKPN2_1_1 | 429 |
| 452 | yojH_1_1 | 430 |
| 453 | aldA_1_1 | 433 |
| 454 | aldA_2_1 | 434 |
| 455 | cim_1_1 | 432 |
| 456 | hemly_1_1 | 435 |
| 457 | pSL017_1_1 | 436 |
| 458 | pSL020_1_1 | 437 |
| 459 | rcaA_1_1 | 438 |
| 460 | rmlC_1_1 | 439 |

| n | Probe Name | SeqID |
|-----|------------|-------|
| 461 | rmlD_1_1 | 440 |
| 462 | waaG_1_1 | 441 |
| 463 | wbbD_1_1 | 442 |
| 464 | wbbM_1_1 | 443 |
| 465 | wbbN_1_1 | 444 |
| 466 | wbdA_1_1 | 445 |
| 467 | wbdC_1_1 | 446 |
| 468 | wztKpn_1_1 | 447 |
| 469 | yibD_1_1 | 448 |
| 470 | glpR_1_1 | 470 |
| 471 | lasRb_1_1 | 471 |
| 472 | OrfX_1_1 | 472 |
| 473 | pa0260_1_1 | 473 |
| 474 | pa0572_1_1 | 474 |
| 475 | pa0625_1_1 | 475 |
| 476 | pa0636_1_1 | 476 |
| 477 | pa1046_1_1 | 477 |
| 478 | pa1069_1_1 | 478 |
| 479 | pa1846_1_1 | 479 |
| 480 | pa3866_1_1 | 480 |
| 481 | pa4082_1_1 | 481 |
| 482 | pilAp_1_1 | 482 |
| 483 | PilAp2_1_1 | 483 |
| 484 | pilC_1_1 | 484 |
| 485 | PstP_1_1 | 485 |
| 486 | purK_1_1 | 486 |
| 487 | uvrDII_1_1 | 487 |
| 488 | vsml_1_1 | 488 |
| 489 | vsmR_1_2 | 489 |
| 490 | xcpX_1_1 | 490 |
| 491 | algB_1_1 | 494 |
| 492 | algN_1_1 | 495 |
| 493 | algR_1_1 | 496 |
| 494 | aprA_1_1 | 491 |
| 495 | aprE_1_1 | 492 |
| 496 | ctx_1_2 | 493 |
| 497 | ExoS_1_1 | 497 |
| 498 | fpvA_1_1 | 498 |
| 499 | lasRa_1_1 | 499 |
| 500 | lipA_1_1 | 500 |
| 501 | lipH_1_1 | 501 |
| 502 | Orf159_1_2 | 502 |
| 503 | Orf252_1_1 | 503 |
| 504 | pchG_1_1 | 504 |
| 505 | PhzA_1_1 | 505 |
| 506 | PhzB_1_1 | 506 |

| n | Probe Name | SeqID |
|-----|----------------|-------|
| 507 | PLC_1_1 | 507 |
| 508 | plcN_1_1 | 508 |
| 509 | plcR_1_1 | 509 |
| 510 | pvdD_1_1 | 510 |
| 511 | pvdF_1_2 | 511 |
| 512 | pyocinS1_1_1 | 512 |
| 513 | pyocinS1im_1_1 | 513 |
| 514 | pyocinS2_1_1 | 514 |
| 515 | pys2_1_1 | 515 |
| 516 | pys2_2_1 | 516 |
| 517 | rbf303_1_1 | 517 |
| 518 | rhIA_1_1 | 518 |
| 519 | rhIB_1_1 | 519 |
| 520 | rhIR_1_1 | 520 |
| 521 | TnAP41_1_2 | 521 |
| 522 | toxA_1_1 | 522 |
| 523 | aad_1_1 | 711 |
| 524 | atfA_1_1 | 706 |
| 525 | atfB_1_1 | 707 |
| 526 | atfC_1_1 | 708 |
| 527 | ccmPrmi1_1_1 | 709 |
| 528 | cyaPrmi_1_1 | 710 |
| 529 | flfB_1_1 | 712 |
| 530 | flfD_1_1 | 713 |
| 531 | flfN_1_1 | 714 |
| 532 | flhD_1_1 | 715 |
| 533 | floA_1_1 | 716 |
| 534 | ftsK_1_1 | 717 |
| 535 | gstB_1_1 | 718 |
| 536 | hemCPrmi_1_1 | 719 |
| 537 | hemDPrmi_1_1 | 720 |
| 538 | hev_1_1 | 721 |
| 539 | katA_1_1 | 722 |
| 540 | lpp1_1_1 | 723 |
| 541 | menE_1_1 | 724 |
| 542 | mfd_1_1 | 725 |
| 543 | nrpA_1_1 | 726 |
| 544 | nrpB_1_1 | 727 |
| 545 | nrpG_1_1 | 728 |
| 546 | nrpS_1_1 | 729 |
| 547 | nrpT_1_1 | 730 |
| 548 | nrpU_1_1 | 731 |
| 549 | pat_1_1 | 732 |
| 550 | pmfA_1_1 | 733 |
| 551 | pmfC_1_1 | 734 |
| 552 | pmfE_1_1 | 735 |

| n | Probe Name | SeqID |
|-----|--------------|-------|
| 553 | ppaA_1_1 | 736 |
| 554 | rsbA_1_1 | 737 |
| 555 | rsbC_1_1 | 738 |
| 556 | speB_1_1 | 739 |
| 557 | stmA_1_1 | 740 |
| 558 | stmB_1_1 | 741 |
| 559 | terA_1_1 | 742 |
| 560 | terD_1_1 | 743 |
| 561 | umoA_1_1 | 744 |
| 562 | umoB_1_1 | 745 |
| 563 | umoC_1_1 | 746 |
| 564 | ureR_1_1 | 747 |
| 565 | xerC_1_1 | 748 |
| 566 | ygbA_1_1 | 749 |
| 567 | flaA_1_1 | 750 |
| 568 | flaD_1_1 | 751 |
| 569 | fliA_1_1 | 752 |
| 570 | hpmA_1_1 | 753 |
| 571 | hpmB_1_1 | 754 |
| 572 | lpsPrmi_1_1 | 755 |
| 573 | mrpA_1_1 | 756 |
| 574 | mrpB_1_1 | 757 |
| 575 | mrpC_1_1 | 758 |
| 576 | mrpD_1_1 | 759 |
| 577 | mrpE_1_1 | 760 |
| 578 | mrpF_1_1 | 761 |
| 579 | mrpG_1_1 | 762 |
| 580 | mrpH_1_1 | 763 |
| 581 | mrpI_1_1 | 764 |
| 582 | mrpJ_1_1 | 765 |
| 583 | patA_1_1 | 766 |
| 584 | putA_1_1 | 767 |
| 585 | uca_1_1 | 768 |
| 586 | ureDPrmi_1_1 | 769 |
| 587 | ureEPrmi_1_1 | 770 |
| 588 | ureFPrmi_1_1 | 771 |
| 589 | zapA_1_1 | 772 |
| 590 | zapB_1_1 | 773 |
| 591 | zapD_1_1 | 774 |
| 592 | zapE_1_1 | 775 |
| 593 | envZPrvu_1_1 | 776 |
| 594 | frdC_1_1 | 777 |
| 595 | frdD_1_1 | 778 |
| 596 | infBPrvu_1_1 | 779 |
| 597 | lad_1_1 | 780 |
| 598 | tna2_1_1 | 781 |

| n | Probe Name | SeqID |
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| 599 | end_1_1 | 782 |
| 600 | pqrA_1_1 | 783 |
| 601 | urg_1_1 | 784 |
| 602 | eD_2_1 | 2892 |
| 603 | eE_1_1 | 2890 |
| 604 | eF_1_1 | 2899 |
| 605 | et_1_1 | 2898 |
| 606 | ORF2-STEMA_1_1 | 2897 |
| 607 | ORF4-STEMA_1_1 | 2896 |
| 608 | pam_1_1 | 2895 |
| 609 | pmp-STEMA_1_1 | 2894 |
| 610 | ppi_1_1 | 2893 |
| 611 | smeE_1_1 | 2889 |
| 612 | smeF4494_1_1 | 2901 |
| 613 | StmPr1_1_1 | 2891 |
| 614 | StmPr2_1_1 | 2900 |
| 615 | 0487Straga_1_1 | 625 |
| 616 | 0488Straga_1_1 | 626 |
| 617 | 0493Straga_1_1 | 627 |
| 618 | 0495Straga_1_1 | 628 |
| 619 | 0498Straga_1_1 | 629 |
| 620 | 0500Straga_1_1 | 630 |
| 621 | 0502Straga_1_1 | 631 |
| 622 | 0504Straga_1_1 | 632 |
| 623 | cpsA1Strgal_1_1 | 606 |
| 624 | cpsB1Strgal_1_1 | 607 |
| 625 | cpsC1Strgal_1_1 | 608 |
| 626 | cpsD1Strgal_1_1 | 609 |
| 627 | cpsE1Strgal_1_1 | 610 |
| 628 | cpsG1Strgal_1_1 | 611 |
| 629 | cpsIStrgal_1_1 | 612 |
| 630 | cpsJStrgal_1_1 | 613 |
| 631 | cpsKStrgal_1_1 | 614 |
| 632 | cpsMStrgal_1_1 | 615 |
| 633 | cpsYStrgal_1_1 | 616 |
| 634 | cpsYStrgal_2_1 | 617 |
| 635 | cylBStraga_1_1 | 618 |
| 636 | cylEStraga_1_1 | 619 |
| 637 | cylFStraga_1_1 | 620 |
| 638 | cylHStraga_1_1 | 621 |
| 639 | cylIStraga_1_1 | 622 |
| 640 | cylJStraga_1_1 | 623 |
| 641 | cylKStraga_1_1 | 624 |
| 642 | foIDStraga_1_1 | 633 |
| 643 | neuA1Strgal_1_1 | 634 |
| 644 | neuB1Strgal_1_1 | 635 |

| n | Probe Name | SeqID |
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| 645 | neuC1Strgal_1_1 | 636 |
| 646 | neuD1Strgal_1_1 | 637 |
| 647 | recNStraga_1_1 | 638 |
| 648 | 0499Straga_1_1 | 642 |
| 649 | CAMPfactor_1_1 | 640 |
| 650 | CAMPfactor_2_1 | 641 |
| 651 | hylStragal_1_1 | 643 |
| 652 | lipStragal_1_1 | 644 |
| 653 | 16SSStrepdyssgal_1_1 | 2842 |
| 654 | 1760Strpneu_1_1 | 546 |
| 655 | acyPStrpneu_1_1 | 547 |
| 656 | cap1EStrpneu_1_1 | 523 |
| 657 | cap1FStrpneu_1_1 | 524 |
| 658 | cap1GStrpneu_1_1 | 525 |
| 659 | cap3AStrpneu_1_1 | 526 |
| 660 | cap3BStrpneu_1_1 | 527 |
| 661 | celAStrpneu_1_1 | 528 |
| 662 | celBStrpneu_1_1 | 529 |
| 663 | cglAStrpneu_1_1 | 530 |
| 664 | cglBStrpneu_1_1 | 531 |
| 665 | cglCStrpneu_1_1 | 532 |
| 666 | cglDStrpneu_1_1 | 533 |
| 667 | cinA_1_1 | 534 |
| 668 | cps14EStrpneum_1_1 | 535 |
| 669 | cps14FStrpneum_1_1 | 536 |
| 670 | cps14GStrpneum_1_1 | 537 |
| 671 | cps14HStrpneum_1_1 | 538 |
| 672 | cps19aHStrpneum_1_1 | 539 |
| 673 | cps19aIStrpneum_1_1 | 540 |
| 674 | cps19aKStrpneum_1_1 | 541 |
| 675 | cps19fGStrpneum_1_1 | 542 |
| 676 | cps23fGStrpneum_1_1 | 543 |
| 677 | dexB_1_1 | 544 |
| 678 | dinF_1_1 | 545 |
| 679 | endAStrpneu_1_1 | 548 |
| 680 | exoAStrpneu_1_1 | 549 |
| 681 | exp72_1_1 | 550 |
| 682 | fnlAStrpneu_1_1 | 551 |
| 683 | fnlBStrpneu_1_1 | 552 |
| 684 | fnlCStrpneu_1_1 | 553 |
| 685 | gct18Strpneum_1_1 | 554 |
| 686 | hexB1_1_1 | 555 |
| 687 | hftsHStrpneu_1_1 | 556 |
| 688 | immunofrag1Strpneu_1_1 | 557 |
| 689 | immunofrag2Strpneu_2_1 | 558 |
| 690 | immunofrag3Strpneu_2_1 | 559 |

| n | Probe Name | SeqID |
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| 691 | kdtBStrpneu_1_1 | 560 |
| 692 | lysAStrpneu_1_1 | 561 |
| 693 | pcpBStrpneu_1_1 | 562 |
| 694 | pflCStrpneu_1_1 | 563 |
| 695 | plpA_1_1 | 564 |
| 696 | prtA1Strpneu_1_1 | 565 |
| 697 | pspC1Strpneu_1_1 | 566 |
| 698 | pspC2_1_1 | 567 |
| 699 | purRStrpneu_1_1 | 568 |
| 700 | pyrDAStrpneum_1_1 | 569 |
| 701 | SP0828Strpneu_1_1 | 570 |
| 702 | SP0830Strpneu_1_1 | 571 |
| 703 | SP0833Strpneu_1_1 | 572 |
| 704 | SP0837_38Strpneu_1_1 | 573 |
| 705 | SP0839Strpneu_1_1 | 574 |
| 706 | ugdStrpneu_1_1 | 575 |
| 707 | uncC_1_1 | 576 |
| 708 | vicXStrpneu_1_1 | 577 |
| 709 | wchA6bStrpneum_1_1 | 578 |
| 710 | wci4Strpneum_1_1 | 579 |
| 711 | wciK4Strpneum_1_1 | 580 |
| 712 | wciL4Strpneum_1_1 | 581 |
| 713 | wciN6bStrpneum_1_1 | 582 |
| 714 | wciO6bStrpneum_1_1 | 583 |
| 715 | wciP6bStrpneum_1_1 | 584 |
| 716 | wciY18Strpneum_1_1 | 585 |
| 717 | wzdbStrpneum_1_1 | 586 |
| 718 | wze6bStrpneum_1_1 | 587 |
| 719 | wzy18Strpneum_1_1 | 588 |
| 720 | wzy4Strpneum_1_1 | 589 |
| 721 | wzy6bStrpneum_1_1 | 590 |
| 722 | xpt_1_1 | 591 |
| 723 | igaStrpneu_1_1 | 592 |
| 724 | lytA_1_1 | 593 |
| 725 | nanA_1_1 | 594 |
| 726 | nanBStrpneu_1_1 | 595 |
| 727 | pcpCStrpneu_1_1 | 596 |
| 728 | ply_1_1 | 597 |
| 729 | prtAStrpneu_1_1 | 598 |
| 730 | pspA_1_2 | 599 |
| 731 | SP0834Strpneu_1_1 | 600 |
| 732 | SP0834Strpneu_1_2 | 601 |
| 733 | sphtraStrpneu_1_1 | 602 |
| 734 | wciJStrpneu_1_1 | 603 |
| 735 | wziyStrpneu_1_1 | 604 |
| 736 | wzxStrpneu_1_1 | 605 |

| n | Probe Name | SeqID |
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| 737 | cyclStrpyog_1_1 | 645 |
| 738 | fah_rph_hlo_Strpyog_1_1 | 646 |
| 739 | int_1_1 | 647 |
| 740 | int315.5_1_1 | 648 |
| 741 | murEStrpyog_1_1 | 649 |
| 742 | oppA_1_1 | 650 |
| 743 | oppCStrpyog_1_1 | 651 |
| 744 | oppD_1_1 | 652 |
| 745 | SPy0382Strpyog_1_1 | 653 |
| 746 | SPy0390Strpyog_1_1 | 654 |
| 747 | SpyM3_1351_1_1 | 655 |
| 748 | vicXStrpyog_1_1 | 656 |
| 749 | DNaseIStrpyog_1_1 | 657 |
| 750 | fba2Strpyog_1_1 | 658 |
| 751 | fhuAStrpyog_1_1 | 659 |
| 752 | fhuB1Strpyog_1_1 | 660 |
| 753 | fhuDStrpyog_1_1 | 661 |
| 754 | fhuGStrpyog_1_1 | 662 |
| 755 | hylA_1_1 | 663 |
| 756 | hylP_1_1 | 664 |
| 757 | hylp2_1_1 | 665 |
| 758 | oppB_1_1 | 666 |
| 759 | ropB_1_1 | 667 |
| 760 | scpAStrpyog_1_1 | 668 |
| 761 | sloStrpyog_1_1 | 669 |
| 762 | smez-4Strpyog_1_1 | 670 |
| 763 | sof_1_1 | 671 |
| 764 | sof_2_1 | 672 |
| 765 | speA_1_1 | 673 |
| 766 | speB2Strpyog_1_1 | 674 |
| 767 | speCStrpyog_1_1 | 675 |
| 768 | speJStrpyog_1_1 | 676 |
| 769 | srtBStrpyog_1_1 | 677 |
| 770 | srtCStrpyog_1_1 | 678 |
| 771 | srtEStrpyog_1_1 | 679 |
| 772 | srtFStrpyog_1_1 | 680 |
| 773 | srtGStrpyog_1_1 | 681 |
| 774 | srtIStrpyog_1_1 | 682 |
| 775 | srtKStrpyog_1_1 | 683 |
| 776 | srtRStrpyog_1_1 | 684 |
| 777 | srtTStrpyog_1_1 | 685 |
| 778 | vicKStrpyog_1_1 | 686 |
| 779 | 573Stprmut_1_1 | 687 |
| 780 | 580SStprmut_1_1 | 688 |
| 781 | 581_582SStprmut_1_1 | 689 |
| 782 | 584SStprmut_1_1 | 690 |

| n | Probe Name | SeqID |
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| 783 | dltAStrmut_1_1 | 691 |
| 784 | dltBStrmut_1_1 | 692 |
| 785 | dltCpx1Strmut_1_1 | 693 |
| 786 | dltDStrmut_1_1 | 694 |
| 787 | lichStrbov_1_1 | 695 |
| 788 | lytRStprmut_1_1 | 696 |
| 789 | lytSStprmut_1_1 | 697 |
| 790 | pepQStrmut_1_1 | 698 |
| 791 | pflCStrmut_1_1 | 699 |
| 792 | recNStprmut_1_1 | 700 |
| 793 | ytqBStrmut_1_1 | 701 |
| 794 | hlyXStrmut_1_1 | 702 |
| 795 | igaStrmitis_1_1 | 703 |
| 796 | igaStrsanguis_1_1 | 704 |
| 797 | perMStrmut_1_1 | 705 |
| 798 | fasCAXStrdysg_1_1 | 2904 |
| 799 | sloStrep_1_1 | 2905 |
| 800 | cataSaur_1_1 | 1 |
| 801 | cataSaur_1_2 | 2 |
| 802 | clfA_1_1 | 3 |
| 803 | clfB_1_1 | 4 |
| 804 | coa_1_1 | 5 |
| 805 | coa_1_2 | 6 |
| 806 | coa_2_2 | 2903 |
| 807 | coa_3_1 | 2902 |
| 808 | epiP-bsaP_1_1 | 58 |
| 809 | geh_1_1 | 59 |
| 810 | gyrA_1_1 | 60 |
| 811 | gyrB_1_1 | 61 |
| 812 | hemB_1_1 | 62 |
| 813 | hemC_1_1 | 63 |
| 814 | hemD_1_1 | 64 |
| 815 | hemN_1_1 | 65 |
| 816 | hsdS_1_1 | 66 |
| 817 | hsdS_2_1 | 67 |
| 818 | lip_1_1 | 68 |
| 819 | menC_1_1 | 69 |
| 820 | murC_1_1 | 70 |
| 821 | nuc_1_1 | 71 |
| 822 | pdhD_1_1 | 72 |
| 823 | rpoB_1_1 | 73 |
| 824 | SAV0431_1_1 | 74 |
| 825 | SAV0439_1_1 | 75 |
| 826 | SAV0440_1_1 | 76 |
| 827 | SAV0441_1_1 | 77 |
| 828 | sigB_1_1 | 78 |

| n | Probe Name | SeqID |
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| 829 | spa_1_2 | 79 |
| 830 | sstC_1_1 | 80 |
| 831 | tag_1_1 | 81 |
| 832 | tyrA_1_1 | 82 |
| 833 | bsaE_1_1 | 100 |
| 834 | bsaG_1_1 | 101 |
| 835 | cap5h_1_1 | 102 |
| 836 | cap5i_1_1 | 103 |
| 837 | cap5j_1_1 | 104 |
| 838 | cap5k_1_1 | 105 |
| 839 | cap8H_1_1 | 106 |
| 840 | cap8I_1_1 | 107 |
| 841 | cap8J_1_1 | 108 |
| 842 | cap8K_1_1 | 109 |
| 843 | EDIN_1_1 | 113 |
| 844 | eta_1_1 | 114 |
| 845 | etb_1_1 | 115 |
| 846 | hglA_1_1 | 116 |
| 847 | hglA_2_1 | 117 |
| 848 | hglB_1_1 | 118 |
| 849 | hglC_2_1 | 119 |
| 850 | hla_1_1 | 120 |
| 851 | hIb_1_2 | 121 |
| 852 | lukF_1_1 | 122 |
| 853 | lukS_1_1 | 123 |
| 854 | lukS_2_1 | 124 |
| 855 | NAG_1_1 | 125 |
| 856 | sak_1_1 | 126 |
| 857 | sea_1_1 | 127 |
| 858 | seb_1_1 | 128 |
| 859 | sec1_1_1 | 129 |
| 860 | seg_1_1 | 130 |
| 861 | seh_1_1 | 131 |
| 862 | sel_1_1 | 132 |
| 863 | set15_1_1 | 133 |
| 864 | set6_1_1 | 134 |
| 865 | set7_1_1 | 135 |
| 866 | set8_1_1 | 136 |
| 867 | sprV8_1_1 | 137 |
| 868 | tst_1_1 | 138 |
| 869 | agrB_1_1 | 178 |
| 870 | agrC_1_1 | 179 |
| 871 | alphSE1368_1_1 | 180 |
| 872 | ardeSE0106_1_1 | 174 |
| 873 | ardeSE0107_1_1 | 175 |
| 874 | aroiSE0105_1_1 | 176 |

| n | Probe Name | SeqID |
|-----|------------------------|-------|
| 875 | atlE_1_1 | 177 |
| 876 | gad_1_1 | 181 |
| 877 | glucSE1191_1_1 | 182 |
| 878 | hsp10_1_1 | 183 |
| 879 | icaA_1_1 | 184 |
| 880 | icaB_1_1 | 185 |
| 881 | mvaSSepid_1_1 | 186 |
| 882 | nitreSE1972_1_1 | 187 |
| 883 | nitreSE1974_1_1 | 188 |
| 884 | nitreSE1975_1_1 | 189 |
| 885 | oiamtSE1209_1_1 | 190 |
| 886 | ORF1Sepid_1_1 | 191 |
| 887 | ORF3bSepid_1_1 | 192 |
| 888 | qacR_1_1 | 193 |
| 889 | sin_1_1 | 194 |
| 890 | ureSE1861_1_1 | 195 |
| 891 | ureSE1863_1_1 | 196 |
| 892 | ureSE1864_1_1 | 197 |
| 893 | ureSE1865_1_1 | 198 |
| 894 | ureSE1867_1_1 | 199 |
| 895 | gcaD_1_1 | 200 |
| 896 | hld_orf5_1_1 | 201 |
| 897 | icaC_1_1 | 202 |
| 898 | icaD_1_1 | 203 |
| 899 | icaR_1_1 | 204 |
| 900 | psm_beta1and2_1_1 | 205 |
| 901 | purR_1_1 | 206 |
| 902 | spoVG_1_1 | 207 |
| 903 | yabJ_1_1 | 208 |
| 904 | folQShaemolyt_1_1 | 209 |
| 905 | mvaCShaemolyticus_1_1 | 210 |
| 906 | mvaDShaemolyt_1_1 | 211 |
| 907 | mvaK1Shaemolyticus_1_1 | 212 |
| 908 | mvaSShaemolyticus_1_1 | 213 |
| 909 | RNApolsigm_1_1 | 214 |
| 910 | lipShaemolyt_1_1 | 215 |
| 911 | ydhK_1_1 | 2906 |
| 912 | agrB2Stalugd_1_1 | 216 |
| 913 | agrC2Stalugd_1_1 | 217 |
| 914 | agrCStalugd_1_1 | 218 |
| 915 | slamStalugd_1_1 | 219 |
| 916 | fblStalugd_1_1 | 220 |
| 917 | slushABCStalugd_1_1 | 221 |
| 918 | RNApolsigmSsapro_1_1 | 222 |
| 919 | RNApolsigmSsapro_1_2 | 223 |
| 920 | msrw1Stwar_1_1 | 224 |

| n | Probe Name | SeqID |
|-----|-----------------|-------|
| 921 | nukMStwar_1_1 | 225 |
| 922 | proDStwar_1_1 | 226 |
| 923 | proMStwar_1_1 | 227 |
| 924 | sigrpoStwar_1_1 | 228 |
| 925 | tnpStwar_1_1 | 229 |
| 926 | gehAStwar_1_1 | 230 |
| 927 | 0135mihck_1_1 | 945 |
| 928 | 0270cap_1_1 | 947 |
| 929 | FAN_1_1 | 946 |
| 930 | p53_1_1 | 944 |

All genes were selected from the literature and databases, compared by BLAST analysis to all other sequences available in the NCBI database. Primers were designed to amplify gene segments of 200 to 800 bp length devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J. and Russell, D.W. 2001. Molecular cloning: a laboratory manual, 3rd ed. Cold Spring Harbor Laboratory Press, New York, N.Y).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 930 recombinant plasmids containing the 930 selected gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobitics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 2.5: Hybridization and scanning

All experiments described represent dual co-hybridizations of two different target DNA samples labelled respectively with Cy3 or Cy5. After removal of unbound label, Cy3 and Cy5 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm

DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilized in the dark. Prior to hybridization the target DNA was reconstituted in 110 µl hybridization solution (30% formamide, 0.1% SDS, 5xSSC) and denatured by heating at 95°C for 3 min prior to hybridization. Hybridization was automatically performed with a TECAN Hybridization Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 42°C for 1 min with 5x SSC and prehybridized in 110 µl denatured prehybridization buffer (30% formamide, 0.1% SDS, 5xSSC, 10mg/ml BSA) for 30 min at 42°C at mild agitation. After injection of 110 µl labelled DNA, hybridization was performed at 60°C for 18 hours at medium agitation. The arrays were washed at 42°C in wash buffer I (1x SSC, 0.1% SDS) - three cycles of 30 sec wash time and 2 min soak time -, in wash buffer II (0.1x SSC, 0.1% SDS) - five cycles of 30 sec wash time and 2 min soak time - and wash buffer III (0.1x SSC) - four cycles of 30 sec wash time and 2 min soak time - and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridized arrays were scanned with GenPix Personal Axon 4100A laser scanner (Axon Instruments, Union City, CA, USA). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5 dye, respectively. Fluorescent images were analyzed by the GenePix Pro 6.0 and Acuity 4.0 software (Axon Instruments). For each feature (gene probe) the median pixel intensity of wavelength 635 nm or 532 nm, respectively, was determined and the median background of the respective wavelength subtracted (F635 Median - B635 and F532 Median - B532, respectively).

Example 2.6: Specificity

In order to allow the simultaneous and rapid identification, differentiation and characterisation of pathogens causing sepsis, a microarray comprising a set of 930 gene probes of 200 to 800 bp length was developed (Tab. 7). The clinically most relevant sepsis causing pathogens were represented on the microarray by gene probes specific for the genera and species *E. coli* (31), *Staphylococcus aureus* (69) and coagulase negative staphylococci (58), *P. aeruginosa* (53), *Streptococcus* spp. (185), *Enterococcus* spp.(92), *Proteus* spp. (79), *Klebsiella* spp.(71), *Enterobacter* spp. (11), *Stenotrophomonas maltophilia* (13), *Acinetobacter baumannii* (21) and *Candida albicans* (86). To allow for parallel detection of antibiotic resistance determinants, the array contained 131 bacterial resistance gene probes.

To facilitate the optimization, validation and standardization of microarray analysis, a set of 29 control probes was included. Different 16S rRNA gene probes (18) served as positive hybridization controls for bacterial DNA. The gene probe *rbcl_1_2* (segment of the rubisco gene of *Hordeum vulgare*) was prelabelled with Cy3 and Cy5 and spotted onto each subarray for visualisation of the array orientation. Gene probes derived from *Mus musculus* (2), *Dictyostelium discoideum* (2), *Homo sapiens* (5), *Hordeum vulgare* (1) were included as negative or positive hybridization controls. In all assays, one to five PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridized with the corresponding probes, indicating that labelling and hybridization had performed efficiently.

The specificity of the DNA-chip was validated with 44 well characterized clinical isolates and reference strains of the target species (40) as well as other related bacteria (4) (Table 8).

Tab. 8: Microorganism strains used for microarray validation. Non-target species are Nos 21, 25, 27 and 30.

| No | Species | Strain | Dye |
|----|----------------------|------------|-----|
| 1 | <i>A. baumannii</i> | DSM 30008 | Cy5 |
| 2 | <i>A. baumannii</i> | 5256-2 | Cy3 |
| 3 | <i>P. aeruginosa</i> | ATCC 27853 | Cy3 |
| 4 | <i>E. coli</i> | CIP 105893 | Cy3 |
| 5 | <i>E. coli</i> | ATCC 25922 | Cy5 |
| 6 | <i>E. coli</i> | CIP 81.88 | Cy3 |
| 7 | <i>E. coli</i> | CIP 74.14 | Cy5 |
| 8 | <i>E. coli</i> | U10338-1 | Cy5 |
| 9 | <i>E. coli</i> | U10164-2 | Cy5 |
| 10 | <i>E. coli</i> | U10248-1 | Cy5 |
| 11 | <i>K. oxytoca</i> | DSM 4798 | Cy5 |
| 12 | <i>K. oxytoca</i> | U10274 | Cy5 |
| 13 | <i>K. pneumoniae</i> | DSM 681 | Cy3 |
| 14 | <i>K. pneumoniae</i> | O3-390 | Cy3 |
| 15 | <i>K. pneumoniae</i> | O8-889 | Cy3 |
| 16 | <i>P. mirabilis</i> | DSM 788 | Cy5 |
| 17 | <i>P. mirabilis</i> | U10515 | Cy5 |

| | | | |
|----|-------------------------|------------|-----|
| 18 | <i>P. mirabilis</i> | U9979-1 | Cy5 |
| 19 | <i>P. vulgaris</i> | DSM 2140 | Cy5 |
| 20 | <i>C. albicans</i> | ATCC 10231 | Cy3 |
| 21 | <i>E. casseliflavus</i> | UW703/95 | Cy5 |
| 22 | <i>E. faecalis</i> | ATCC 29212 | Cy5 |
| 23 | <i>E. faecalis</i> | UW700/95 | Cy5 |
| 24 | <i>E. faecium</i> | VRE 9182 | Cy3 |
| 25 | <i>E. gallinarum</i> | UW701/97 | Cy3 |
| 26 | <i>S. agalactiae</i> | DSM 2134 | Cy5 |
| 27 | <i>S. angiosus</i> | DSM 20563 | Cy3 |
| 28 | <i>S. bovis</i> | DSM 20480 | Cy3 |
| 29 | <i>S. dysgalactiae</i> | DSM 20662 | Cy3 |
| 30 | <i>S. gordonii</i> | DSM 6777 | Cy5 |
| 31 | <i>S. mutans</i> | DSM 20523 | Cy3 |
| 32 | <i>S. pneumoniae</i> | ATCC 49619 | Cy3 |
| 33 | <i>S. pyogenes</i> | DSM 11723 | Cy3 |
| 34 | <i>S. aureus</i> | ATCC 29213 | Cy3 |
| 35 | <i>S. aureus</i> | P2716 | Cy3 |
| 36 | <i>S. aureus</i> | C5010 | Cy3 |
| 37 | <i>S. aureus</i> | MW2 | Cy3 |
| 38 | <i>S. epidermidis</i> | ATCC 12228 | Cy5 |
| 39 | <i>S. epidermidis</i> | BC 1920 | Cy5 |
| 40 | <i>S. haemolyticus</i> | DSM 20263 | Cy5 |
| 41 | <i>S. hominis</i> | DSM 20228 | Cy5 |
| 42 | <i>S. lugdunensis</i> | DSM 4804 | CY3 |
| 43 | <i>S. saprophyticus</i> | ATCC 14953 | Cy3 |
| 44 | <i>S. warneri</i> | DSM 20316 | Cy5 |

Hybridization experiments with DNA obtained from the respective target strains revealed hybridization profiles specific for the different species and genera (Fig. 7). In contrast, non-target organisms hybridized nearly exclusively with 16S rRNA (Probe Nos. 1-24) and antibiotic gene probes (Probe Nos. 26-156) (Fig. 7 panels G and H).

Example 2.7: Specificity of hybridization profiles for fungi

DNA of the fungus *Candida albicans* hybridized specifically with the *Candida* gene probes (Probe Nos. 157-242) including *Candida* resistance probes but not with bacterial 16 rRNA or species specific probes (Fig. 8, panel A). The specificity of two selected *Candida* probes is demonstrated in Fig. 8 panel B, the probes *ALS1* and *ASL43f* hybridized only with DNA obtained from *C. albicans* and not with any DNA obtained from the 43 bacterial strains.

Example 2.8: Specificity of hybridization profiles for Gram-negative bacteria

Strains of the genus *Klebsiella* showed specific hybridization with the *Klebsiella* gene probes (Probe Nos. 399-469). For this genus cross hybridization with lower intensity of the fluorescent signals was observed with some *E. coli* and *P. aeruginosa* probes (Nos. 275-306 and 470-522, respectively). This is also the case for bacterial strains of the genus *Proteus*, which show major hybridization with the *Proteus* gene probes allowing unambiguous identification (Probe Nos. 523-601). Vice versa, *P. aeruginosa* and *E. coli* can be easily identified by their hybridization profiles, but show minor cross hybridization with gene probes of *Klebsiella*, *E. coli* and *P. aeruginosa*, respectively. The *E. coli* reference strain CIP 105893 and the clinical isolate U10164-2 show nearly identical hybridization profiles, demonstrating the high reproducibility of the assay. Strains of the non-fermenting Gram-negative bacterium *A. baumannii* were readily identified based on their microarray hybridization profile showing specific hybridization to the *A. baumannii* gene probes (Nos. 243-263). The specificity of selected species specific probes is shown in Figure 9. The *A. baumannii* probe *csuA* hybridized only with labelled DNA preparations derived from *A. baumannii* strain DSM 30008 and the clinical *A. baumannii* isolate but not with any other of the 42 strains. The *P. aeruginosa* probe *PhzA* showed hybridization signals with a high intensity >60000 (Median fluorescence – background) only with DNA of the *P. aeruginosa* reference strain but with no other pathogen, demonstrating that although some *P. aeruginosa* probes (eg. *aprA*) show cross-hybridization with other Gram-negative species, unambiguous identification is feasible. Equally specific results were obtained with the *E. coli* probe *shuA*, which showed significant hybridization signals > 40000 only with DNA of the seven *E. coli* reference strains and clinical isolates. The closely related species *K. oxytoca* and *K. pneumoniae* were easily identified and discriminated from each other by the *K. oxytoca* probe *tagK* and the *K. pneumoniae*

probe *acoC*. The *P. mirabilis* probe *hpmB* was highly specific for the three *P. mirabilis* strains and isolates, while probe *enzZPrvu* was specific for *P. vulgaris*.

Example 2.9: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Enterococcus*

The microarray assay was highly specific in the identification of Gram-positive target species. Clinical isolates of the species *E. faecalis* and *E. faecium* could be identified and discriminated unambiguously by their hybridization profiles (Probe Nos. 307-375 and 376-398, respectively) (Fig. 7, panels E and F). The vancomycin resistant non-target strain *E. casseliflavus* (Fig. 7, panel G) showed hybridization to the bacterial 16S rRNA probes, the antibiotic resistance gene probes *vanC-2* (vancomycin resistance), *arr2* (Rifampin resistance) and *tetM* (tetracycline resistance) and the *S. aureus* probes *gyrA* (DNA gyrase subunit A), *rpoB* (RNA polymerase B subunit) and *sstC* (iron transport protein) only. This profile does not permit species identification but indicates a vancomycin resistant bacterium. A similar profile was obtained for the vancomycin resistant non-target strain *E. gallinarum* (not shown).

Example 2.10: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Streptococcus*

Microarray hybridization assays performed with streptococcal DNA obtained from reference strains of *S. pneumoniae*, *S. pyogenes*, *S. mutans* and *S. agalactae* revealed species specific hybridization profiles and an excellent identification and discrimination of these target organisms (Fig. 7). The species *S. dysgalactiae* and *S. bovis* (*S. viridans* group) are each represented by a single gene probe on the array (*fasCAXStrdysg* and *lichStrbov*, respectively). These probes however exhibited specific hybridization to the target DNA only, and in this way permitted identification of the two species. Additionally both species showed hybridization with the 16S rRNA gene probes and *pbp2b* (penicillin binding protein of *S. pneumoniae*). Furthermore, *S. dysgalactiae* DNA hybridized with the probes *dacCStrpyog* and *murEStrpyog* and *S. bovis* DNA with *gyrA*, *rpoB* and *sstC* as *E. casseliflavus*. The non-target species *S. gordonii* and *S. angiosus* were readily discriminated by their hybridization profiles from other streptococci, *S. gordonii*

showed hybridization to the 16S rRNA genes only, *S. angiosus* DNA hybridized additionally to *gyrB* and *rpoB* (Fig. 7 H).

Example 2.11: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Staphylococcus*

Hybridization assays performed with *S. aureus* strains and *S. epidermidis* DNA produced very specific hybridization profiles with little cross hybridization (Fig. 7 AB). The specificity of selected probes for coagulase-negative staphylococci is shown in Fig. 10. *S. saprophyticus*, *S. haemolyticus*, *S. lugdunensis*, *S. warneri* and *S. hominis* produced hybridization profiles distinct of those from *S. aureus* and *S. epidermidis*. For these species the following species specific probes were detected: *RNAposigmSsapro_1* and *_2* for *S. saprophyticus*, *RNApolisigm* and *mvaDShaemolyt* for *S. haemolyticus*, *agrCStalugd*, *slamStalugd* and *fbIStalug* for *S. lugdunensis* and *proDStwar*, *gehASTwar* and *msrw1Stwar* for *S. warneri*. For *S. hominis* no probe proved to be species specific. The *S. hominis* derived probe *ydHK* cross hybridized with DNA of *S. hominis*, *S. epidermidis* and *S. haemolyticus*. However, certain probe patterns seem to be species specific for *S. hominis* and may allow identification and discrimination from *S. haemolyticus* and other CoNS (eg. hybridization of *ydHK*, *tnpStwar* and *sin* and absence of *mvaDShaemolyt* and *RNApolisigm*).

Example 2.12: Detection of antibiotic resistance determinants in Gram-negative bacteria

Susceptibility results determined by the VITEK2 system were compared to the results of the microarray hybridization assay for the simultaneous detection of antibiotic resistance genes.

For the Gram-negative enterobacteria *E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis* and *P. vulgaris* there was a 100% correlation between phenotypic resistance to aminoglycosides (Gentamycin, Tobramycin) and hybridization to at least one of the aminoglycoside gene probes *aacA4*, *aacC2*, *aadA*, *aacA* and *_aphDStwar* (Table 9).

Tab. 9: Aminoglycoside resistance of Gram-negative enterobacteria:

| Strain | Aminoglycoside | Aminoglycoside |
|--------|----------------|----------------|
|--------|----------------|----------------|

| | resistance phenotype ^a | resistance gene |
|------------------------------|-----------------------------------|--------------------------------------|
| <i>E. coli</i> CIP 105893 | GENi, TOB | aacA4, aadA |
| <i>E. coli</i> ATCC 25922 | susceptible | - |
| <i>E. coli</i> CIP 81.88 | susceptible | - |
| <i>E. coli</i> CIP 74.14 | STR | - |
| <i>E. coli</i> U10338-1 | GENi, TOB | aacA4 |
| <i>E. coli</i> U10164-2 | GEN, TOB | aacC2 |
| <i>E. coli</i> U10248-1 | GEN, TOB | aacC2, strB |
| <i>K. oxytoca</i> DSM 4798 | susceptible | - |
| <i>K. oxytoca</i> U10274 | susceptible | - |
| <i>K. pneumoniae</i> DSM 681 | susceptible | - |
| <i>K. pneumoniae</i> 390 | susceptible | - |
| <i>K. pneumoniae</i> 889 | susceptible | strB |
| <i>P. mirabilis</i> DSM 788 | susceptible | - |
| <i>P. mirabilis</i> U10515 | susceptible | aacC1 |
| <i>P. mirabilis</i> U9979-1 | GEN, TOB | aacC2, aadA, aacA_aphDStwar, strB |
| <i>P. vulgaris</i> DSM 2140 | susceptible | - |

^aGEN Gentamycin; TOB tobramycin; STR Streptomycin, resistance was not tested routinely; i, intermediary resistance

All enterobacterial strains which showed resistance to β -lactam antibiotics (penicillin and cephalosporines) hybridized with at least one or more β -lactamase gene probes (*bla*CTX-M, *bla*FOX-3 and -6, *bla*PRMI, *bla*TEM, *bla*SHV, *bla*OXY-KLOX, *bla*A) (Table 10). There was no hybridization with the resistance gene probes *ampC* and *bla*OXA with any of the tested strains.

10 Tab. 10: β -lactam resistance of Gram-negative enterobacteria:

| Strain | β -lactam resistance phenotype ^a | β -lactamase genotype ^b |
|---------------------------|---|--|
| <i>E. coli</i> CIP 105893 | ESBL | blaCTX-M-22, blaFOX-3, blaFOX-6, blaPRMI, blaTEM |
| <i>E. coli</i> ATCC 25922 | susceptible | - |
| <i>E. coli</i> CIP 81.88 | susceptible | - |
| <i>E. coli</i> CIP 74.14 | susceptible | - |
| <i>E. coli</i> U10338-1 | ESBL | blaCTX-M-22, blaTEM |

| | | |
|------------------------------|-----------------------------------|---|
| <i>E. coli</i> U10164-2 | ESBL | blaCTX-M-22, blaOXY, blaPRMI, blaTEM |
| <i>E. coli</i> U10248-1 | AMP, ASU, MEZ, PRLi, TZPi, CXM | blaCTX-M-22, blaPRMI, blaSHV, blaTEM |
| <i>K. oxytoca</i> DSM 4798 | AMP, ASUi, MEZi | blaOXY |
| <i>K. oxytoca</i> U10274 | ESBL | blaCTX-M-22, blaOXY, blaOXY- KLOX, blaSHV |
| <i>K. pneumoniae</i> DSM 681 | AMP, ASUi, MEZi, PRLi | blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaSHV |
| <i>K. pneumoniae</i> 390 | AMP, ASUi, MEZi | blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaOXY- KLOX, blaSHV |
| <i>K. pneumoniae</i> 889 | AMPi | blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY-KLOX, blaSHV |
| <i>P. mirabilis</i> DSM 788 | KZi, CXMi, IMP | - |
| <i>P. mirabilis</i> U10515 | ESBL, IMP | blaCTX-M-22, |
| <i>P. mirabilis</i> U9979-1 | ESBL, IMP | blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaPRMI, blaTEM |
| <i>P. vulgaris</i> DSM 2140 | AMP, KZ | blaA ^d |

^aESBL extended spectrum β -lactamases; AMP, Ampicillin; ASU, Ampicillin/Sublactam; MEZ, Mezlocillin; PRL, Piperacillin; KZ, Cefazolin; CXM, Cefuroxim; IMP, Imipenem; i, intermediary resistance

^bFluorescence signals ≥ 10000 were considered positive.

5 ^cFluorescence < 10000 ; most fluorescence signals were < 30000 for the hybridization assay with *P. vulgaris* DMS 2140

10 Strains susceptible to β -lactam antibiotics did not show significant hybridization signals (Median fluorescence – background < 10000) with any of the β -lactamase gene probes. Although the hybridization pattern permitted the detection of different types of β -lactamases (*blaTEM*, *blaSHV*, *blaCTX-M*, *blaFOX*), it did, however, not allow the detection and discrimination of extended spectrum β -lactamases (ESBL). For the two clinical isolates of *P. mirabilis* the ESBL phenotype was correlated with hybridization of the *acrA*, *-B* and *-R* genes, which encode a multidrug efflux pump.

15 Furthermore, for these two species, resistance to tetracycline was correlated with hybridization of the *P. mirabilis* derived gene probe *tetA_J*.

Example 2.13: Detection of antibiotic resistance determinants in Gram-positive bacteria

The phenotypic vancomycin resistance of the tested enterococci correlated by 100% with the genotypic resistance determined by microarray hybridization (Table 11).

Tab. 11: Phenotypic and genotypic resistance of *Enterococcus* strains.

| Strain | Resistance phenotype ^a | Resistance genotype | | | | |
|----------------------------------|--|--------------------------|-------------------|-------------|-------------------|-------------------------|
| | | Aminoglycosides | Glycopeptides | Macrolides | Tetracycline | Efflux pumps |
| <i>E. casseliflavus</i> UW703/95 | VAN, DA, QDi | - | <i>vanC</i> | - | <i>tetM</i> | - |
| <i>E. faecalis</i> ATCC 29212 | DA, Ei, QD, TET, SXT | - | - | - | <i>tetM</i> | <i>emeA</i> |
| <i>E. faecalis</i> UW700/95 | VAN, DA, E, GEN, QD, STR, SXT | <i>aacA-aphD</i> | <i>vanB</i> | <i>ermB</i> | - | <i>emeA^b</i> |
| <i>E. faecium</i> VRE9182 | VAN, AMPi, DA, E, QDi, STR, Teicoplanin, TET | <i>aphA3^b</i> | <i>vanA, vanB</i> | <i>ermB</i> | <i>tetL, tetM</i> | <i>msrCb</i> |
| <i>E. gallinarum</i> UW701/97 | VAN, DA, QDi, SXT, TET | - | <i>vanC</i> | - | <i>tetM</i> | - |

^aVAN, vancomycin; DA, clindamycin; E, erythromycin; QD, quinupristin/dalfopristin (streptogramins); STR, streptomycin, TET, tetracycline; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Hybridization to the *vanC*-2 gene was observed for the two vancomycin resistant strains *E. casseliflavus* and *E. gallinarum*, which contain the *vanC*-2 and the *vanC*-1 gene, respectively. The *vanB* gene was detected in the clinical isolates of *E. faecalis* UW700/95 and *E. faecium* VRE9182, the latter strain also hybridized with the *vanA* gene, indicating the presence of both genes. Furthermore, these two strains showed hybridization with aminoglycoside resistance genes (*aacA-aphD* and *aphA3*, respectively) and the macrolide resistance gene *ermB* (Table 11). The presence of efflux pumps involved in macrolide resistance was indicated by microarray hybridization for both *E. faecalis* strains (*emeA*) and *E. faecium* VRE9182 (*msrCb*).

Genotypic resistance to tetracycline was detected for four of the five strains (hybridization to *tetL* and/or *tetM*).

The tested streptococci showed phenotypic susceptibility to all tested antibiotics.

- 5 For staphylococci, there was 100% correlation between phenotypic resistance to penicillin and hybridization of the *blaZ* and the *blaIShaemolyt* gene probes and between oxacillin resistance and hybridization to the *mecA* gene (Table 12).

Tab. 12: Phenotypic and genotypic resistance of *Staphylococcus* strains.

| Strain | Resistance phenotype ^a | Resistance genotype | | | |
|------------------------------------|-----------------------------------|---|--|-------------|---------------------------|
| | | Aminoglycosides | β-lactams | Macrolides | Efflux pumps |
| <i>S. aureus</i> ATCC 29213 | PEN | - | <i>blaZ</i> , <i>blaIShaemolyt</i> | - | <i>msrA</i> , <i>mreA</i> |
| <i>S. aureus</i> P2116 | PEN, Ei, DAi, | - | <i>blaZ</i> , <i>blaIShaemolyt</i> | - | <i>msrA</i> , <i>mreA</i> |
| <i>S. aureus</i> C5010 | TOB, PEN, OXA, E, DA | <i>aadD</i> | <i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i> | <i>ermA</i> | <i>msrA</i> , <i>mreA</i> |
| <i>S. aureus</i> MW2 | PEN, OXA, Trimethoprim | - | | - | <i>msrA</i> , <i>mreA</i> |
| <i>S. epidermidis</i> ATCC 12228 | PEN | - | <i>blaZ</i> , <i>blaIShaemolyt</i> | - | - |
| <i>S. epidermidis</i> BC1920 | GEN, TOB, PEN, OXA, E, DA | <i>aadD</i> , <i>aacA-aphD</i> , <i>aacA_aphDStwar</i> | <i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i> | <i>ermC</i> | - |
| <i>S. haemolyticus</i> DSM 20263 | susceptible | - | - | - | - |
| <i>S. hominis</i> DSM 20228 | susceptible | - | - | - | - |
| <i>S. lugdunensis</i> DSM 4804 | susceptible | - | - | - | - |
| <i>S. saprophyticus</i> ATCC 14953 | susceptible | - | - | - | - |
| <i>S. warneri</i> DSM 20316 | susceptible | - | - | - | - |

^aPEN, penicillin; OXA, oxacillin; DA, clindamycin; E, erythromycin; TOB, tobramycin; GEN, gentamicin; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Resistance to macrolides (erythromycin and clindamycin) was conferred by the *ermA* gene to the clinical MRSA isolate C5010 and by *ermC* to the MRSE isolate

BC1920. Both strains also showed resistance to tobramycin, which was conferred by the *aadD* gene, additionally the *S. epidermidis* isolate was resistant to gentamycin, due to possession of the *aacA-aphD* gene (Table 12). With the exception of the *S. epidermidis* strains, all CoNS showed a susceptible phenotype and did not hybridize with any of the resistance gene probes.

Example 2.14: Strain discrimination and detection of virulence genes in *S. aureus*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of four different *S. aureus* strains are listed in Table 13.

Tab. 13: Hybridization of *S. aureus* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000-20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000. Percentage of identity for gene probe sequences complementary to the genes present in the fully sequenced strain MW2 is given in the last column.

| <i>S. aureus</i> virulence gene probes | <i>S. aureus</i> ATCC 29213 | <i>S. aureus</i> P2116 | MRSA C5010 | MRSA MW2 | Sequence identity with MW2 genome sequence |
|---|--|-----------------------------------|-----------------------|---------------------|---|
| <i>epiP-bsaP</i> | - | - | - | +++ | 100% |
| <i>hsdS1</i> | +++ | - | +++ | - | Not present |
| <i>SAV0441</i> | +++ | - | +++ | + | Not present |
| <i>bsaE</i> | - | - | + | +++ | 100% |
| <i>bsaG</i> | ++ | ++ | +++ | +++ | 100% |
| <i>cap5</i> | +++ | - | +++ | - | Not present |
| <i>cap8</i> | - | +++ | - | +++ | 100% |
| <i>EDIN</i> | +++ | - | - | - | Not present - |
| <i>lukF</i> | + | ++ | ++ | +++ | 95% |
| <i>lukS1</i> | + | + | ++ | +++ | 98% |
| <i>sea</i> | +++ | - | +++ | +++ | 100% |
| <i>sec1</i> | - | - | + | +++ | 98% |
| <i>seg1</i> | +++ | - | +++ | + | Not present |

| | | | | | |
|-------------------|---|---|----|-----|------|
| <i>seh</i> | - | + | ++ | +++ | 100% |
| <i>sel</i> | - | - | + | +++ | 99% |

For other *S. aureus* gene probes the fluorescence intensities were either very low (MF-B <10000) for all four strains indicating the absence of the according gene (eg. *tst*, *eta* or *etb*) or very high (MF-B >50000), indicating the presence of the according gene in all four strains (eg. *hglA*, *hglB*, *hglC*, *NAG*, *sak*, *set*, *sprV8*). Capsular polysaccharides enhance microbial virulence by rendering the bacterium resistant to phagocytosis. Among the eleven capsular serotypes of *S. aureus*, serotypes 5 and 8 account for $\approx 25\%$ and 50% , respectively, of isolates recovered from humans. Moreover, these two serotypes, carrying the genes *cap5* and *cap8*, are prevalent among isolates from clinical infections as well as from commensal sources. By microarray hybridization the *cap5* gene was detected in the ATCC 29213 strain and the clinical MRSA isolate C5010, while *cap8* was detected in the clinical isolate P2116 and the community-acquired MRSA strain MW2 (Table 13). The latter strain hybridized to many virulence gene probes including the leukocidin gene probes *lukF* and *lukS* and the enterotoxin gene probes *sea*, *sec*, *seh* and *sel*. This microarray gene profile is in perfect concordance with genome sequence of this fully sequenced strain, which produces the Pantone-Valentine leukocidin (PVL), encoded by *lukF* and *lukS*. Pantone-Valentine leukocidin forms non-specific pores in leukocyte plasma membranes, which result in increased permeability and eventual host cell lysis. While strain MW2 does not harbor the gene *seg* encoding enterotoxin G, this gene was detected in the ATCC strain and the clinical MRSA isolate C5010, which both also showed hybridization with *sea* (Enterotoxin A). In contrast, the clinical isolate P2116 showed no or only minor hybridization with these virulence probes. From these results it can be concluded that microarray hybridization patterns allow the discrimination of different *S. aureus* strains as well as the detection of clinically relevant virulence determinants.

Example 2.15: Strain discrimination and detection of virulence genes in *E. coli*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of seven different *E. coli* strains are listed in Table 14.

Tab. 14: Hybridization of *E. coli* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000 -20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000.

| | <i>E. coli</i> CIP 105893 ESBL | <i>E. coli</i> ATCC 25922 | <i>E. coli</i> CIP 81.88 | <i>E. coli</i> CIP 74.14 | <i>E. coli</i> U10338-1 ESBL | <i>E. coli</i> U10164-2 ESBL, GEN-R | <i>E. coli</i> U10248-1 GEN-R |
|---------------------|---|---------------------------------|--------------------------------|--------------------------------|------------------------------------|--|-------------------------------------|
| <i>b1169</i> | +++ | ++ | +++ | ++ | +++ | +++ | - |
| <i>ycdS</i> | +++ | ++ | +++ | ++ | +++ | +++ | - |
| <i>ymcA</i> | +++ | + | +++ | - | - | + | + |
| <i>b1202</i> | +++ | - | +++ | - | - | - | +++ |
| <i>fteA</i> | + | + | - | ++ | +++ | +++ | ++ |
| <i>iucA</i> | + | ++ | - | - | +++ | +++ | +++ |
| <i>iucB</i> | - | ++ | - | - | ++ | +++ | ++ |
| <i>iucC</i> | + | ++ | - | - | +++ | +++ | +++ |
| <i>papG</i> | - | +++ | - | ++ | - | - | +++ |

5

None of the listed genes was detected in all seven strains. Major hybridization of the *iuc* aerobactin synthesis genes was detected for four strains. The genes *fteA* (allele of *papA*) and *papG*, both involved in adhesion to host cells and virulence in urinary tract infections were detected in five strains. The three clinical isolates U10338-1, U10164-2 and U10248-1 were all isolated from patients with urinary tract infections. Based on the virulence hybridization pattern, strains U10338-1 and U10164-2 are nearly identical, while strain U10248-1 can be clearly discriminated.

10

Sequence Listing – Free text**a) Probe sequences**

| SEQ ID NO | Probe name | Template source |
|------------------|-------------------|------------------------------|
| 1 | cataSaur_1_1 | <i>Staphylococcus aureus</i> |
| 2 | cataSaur_1_2 | <i>Staphylococcus aureus</i> |
| 3 | clfA_1_1 | <i>Staphylococcus aureus</i> |
| 4 | clfB_1_1 | <i>Staphylococcus aureus</i> |
| 5 | coa_1_1 | <i>Staphylococcus aureus</i> |
| 6 | coa_1_2 | <i>Staphylococcus aureus</i> |
| 7 | I-clpC_1_1 | <i>Staphylococcus aureus</i> |
| 8 | I-clpP_1_1 | <i>Staphylococcus aureus</i> |
| 9 | I-ctaA_1_1 | <i>Staphylococcus aureus</i> |
| 10 | I-ctsR_1_1 | <i>Staphylococcus aureus</i> |
| 11 | I-dltA_1_1 | <i>Staphylococcus aureus</i> |
| 12 | I-dltB_1_1 | <i>Staphylococcus aureus</i> |
| 13 | I-dltC_1_1 | <i>Staphylococcus aureus</i> |
| 14 | I-dnaK_1_1 | <i>Staphylococcus aureus</i> |
| 15 | I-elkT_1_1 | <i>Staphylococcus aureus</i> |
| 16 | I-femD_1_1 | <i>Staphylococcus aureus</i> |
| 17 | I-glnA_1_1 | <i>Staphylococcus aureus</i> |
| 18 | I-glnR_1_1 | <i>Staphylococcus aureus</i> |
| 19 | I-grlA_1_1 | <i>Staphylococcus aureus</i> |
| 20 | I-grlB_1_1 | <i>Staphylococcus aureus</i> |
| 21 | I-groEL_1_1 | <i>Staphylococcus aureus</i> |
| 22 | I-groES_1_1 | <i>Staphylococcus aureus</i> |
| 23 | I-hemA_1_1 | <i>Staphylococcus aureus</i> |
| 24 | I-hemE_1_1 | <i>Staphylococcus aureus</i> |
| 25 | I-hemH_1_1 | <i>Staphylococcus aureus</i> |
| 26 | I-hemL_1_1 | <i>Staphylococcus aureus</i> |
| 27 | I-hemY_1_1 | <i>Staphylococcus aureus</i> |
| 28 | I-lepA_1_1 | <i>Staphylococcus aureus</i> |
| 29 | I-lrgA_1_1 | <i>Staphylococcus aureus</i> |
| 30 | I-lrgB_1_1 | <i>Staphylococcus aureus</i> |
| 31 | I-lytM_1_1 | <i>Staphylococcus aureus</i> |
| 32 | I-menB_1_1 | <i>Staphylococcus aureus</i> |
| 33 | I-menD_1_1 | <i>Staphylococcus aureus</i> |
| 34 | I-menE_1_1 | <i>Staphylococcus aureus</i> |
| 35 | I-menF_1_1 | <i>Staphylococcus aureus</i> |
| 36 | I-mreB_1_1 | <i>Staphylococcus aureus</i> |
| 37 | I-mreR_1_1 | <i>Staphylococcus aureus</i> |
| 38 | I-mutL_1_1 | <i>Staphylococcus aureus</i> |
| 39 | I-mutS_1_1 | <i>Staphylococcus aureus</i> |
| 40 | I-NAG_1_1 | <i>Staphylococcus aureus</i> |
| 41 | I-pbg_1_1 | <i>Staphylococcus aureus</i> |
| 42 | I-pbpF_1_1 | <i>Staphylococcus aureus</i> |
| 43 | I-pdhB_1_1 | <i>Staphylococcus aureus</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------|------------------------------|
| 44 | I-pdhC_1_1 | <i>Staphylococcus aureus</i> |
| 45 | I-rsbU_1_1 | <i>Staphylococcus aureus</i> |
| 46 | I-rsbV_1_1 | <i>Staphylococcus aureus</i> |
| 47 | I-rsbW_1_1 | <i>Staphylococcus aureus</i> |
| 48 | I-sgp_1_1 | <i>Staphylococcus aureus</i> |
| 49 | I-sirR_1_1 | <i>Staphylococcus aureus</i> |
| 50 | I-sodA_1_1 | <i>Staphylococcus aureus</i> |
| 51 | I-sodB_1_1 | <i>Staphylococcus aureus</i> |
| 52 | I-sstA_1_1 | <i>Staphylococcus aureus</i> |
| 53 | I-sstB_1_1 | <i>Staphylococcus aureus</i> |
| 54 | I-sstC_1_1 | <i>Staphylococcus aureus</i> |
| 55 | I-sstD_1_1 | <i>Staphylococcus aureus</i> |
| 56 | I-trx_1_1 | <i>Staphylococcus aureus</i> |
| 57 | I-yhiN_1_1 | <i>Staphylococcus aureus</i> |
| 58 | epiP-bsaP_1_1 | <i>Staphylococcus aureus</i> |
| 59 | geh_1_1 | <i>Staphylococcus aureus</i> |
| 60 | gyrA_1_1 | <i>Staphylococcus aureus</i> |
| 61 | gyrB_1_1 | <i>Staphylococcus aureus</i> |
| 62 | hemB_1_1 | <i>Staphylococcus aureus</i> |
| 63 | hemC_1_1 | <i>Staphylococcus aureus</i> |
| 64 | hemD_1_1 | <i>Staphylococcus aureus</i> |
| 65 | hemN_1_1 | <i>Staphylococcus aureus</i> |
| 66 | hsdS_1_1 | <i>Staphylococcus aureus</i> |
| 67 | hsdS_2_1 | <i>Staphylococcus aureus</i> |
| 68 | lip_1_1 | <i>Staphylococcus aureus</i> |
| 69 | menC_1_1 | <i>Staphylococcus aureus</i> |
| 70 | murC_1_1 | <i>Staphylococcus aureus</i> |
| 71 | nuc_1_1 | <i>Staphylococcus aureus</i> |
| 72 | pdhD_1_1 | <i>Staphylococcus aureus</i> |
| 73 | rpoB_1_1 | <i>Staphylococcus aureus</i> |
| 74 | SAV0431_1_1 | <i>Staphylococcus aureus</i> |
| 75 | SAV0439_1_1 | <i>Staphylococcus aureus</i> |
| 76 | SAV0440_1_1 | <i>Staphylococcus aureus</i> |
| 77 | SAV0441_1_1 | <i>Staphylococcus aureus</i> |
| 78 | sigB_1_1 | <i>Staphylococcus aureus</i> |
| 79 | spa_1_2 | <i>Staphylococcus aureus</i> |
| 80 | sstC_1_1 | <i>Staphylococcus aureus</i> |
| 81 | tag_1_1 | <i>Staphylococcus aureus</i> |
| 82 | tyrA_1_1 | <i>Staphylococcus aureus</i> |
| 83 | I-aroC_1_1 | <i>Staphylococcus aureus</i> |
| 84 | I-aroA_1_1 | <i>Staphylococcus aureus</i> |
| 85 | I-cna_1_1 | <i>Staphylococcus aureus</i> |
| 86 | I-ebpS_1_1 | <i>Staphylococcus aureus</i> |
| 87 | I-eno_1_1 | <i>Staphylococcus aureus</i> |
| 88 | I-fbpA_1_1 | <i>Staphylococcus aureus</i> |
| 89 | I-fib_1_1 | <i>Staphylococcus aureus</i> |

| SEQ ID NO | Probe name | Template source |
|------------------|-------------------|------------------------------|
| 90 | I-fnbB_1_1 | <i>Staphylococcus aureus</i> |
| 91 | I-srtA_1_1 | <i>Staphylococcus aureus</i> |
| 92 | I-stpC_1_1 | <i>Staphylococcus aureus</i> |
| 93 | I-fnbA_1_1 | <i>Staphylococcus aureus</i> |
| 94 | I-spa_1_1 | <i>Staphylococcus aureus</i> |
| 95 | I-aroE_1_1 | <i>Staphylococcus aureus</i> |
| 96 | I-aroF_1_1 | <i>Staphylococcus aureus</i> |
| 97 | I-aroG_1_1 | <i>Staphylococcus aureus</i> |
| 98 | I-asp23_1_1 | <i>Staphylococcus aureus</i> |
| 99 | I-atl_1_1 | <i>Staphylococcus aureus</i> |
| 100 | bsaE_1_1 | <i>Staphylococcus aureus</i> |
| 101 | bsaG_1_1 | <i>Staphylococcus aureus</i> |
| 102 | cap5h_1_1 | <i>Staphylococcus aureus</i> |
| 103 | cap5i_1_1 | <i>Staphylococcus aureus</i> |
| 104 | cap5j_1_1 | <i>Staphylococcus aureus</i> |
| 105 | cap5k_1_1 | <i>Staphylococcus aureus</i> |
| 106 | cap8H_1_1 | <i>Staphylococcus aureus</i> |
| 107 | cap8I_1_1 | <i>Staphylococcus aureus</i> |
| 108 | cap8J_1_1 | <i>Staphylococcus aureus</i> |
| 109 | cap8K_1_1 | <i>Staphylococcus aureus</i> |
| 110 | I-hld_1_1 | <i>Staphylococcus aureus</i> |
| 111 | I-hysA_1_1 | <i>Staphylococcus aureus</i> |
| 112 | I-IgGbg_1_1 | <i>Staphylococcus aureus</i> |
| 113 | EDIN_1_1 | <i>Staphylococcus aureus</i> |
| 114 | eta_1_1 | <i>Staphylococcus aureus</i> |
| 115 | etb_1_1 | <i>Staphylococcus aureus</i> |
| 116 | hglA_1_1 | <i>Staphylococcus aureus</i> |
| 117 | hglA_2_1 | <i>Staphylococcus aureus</i> |
| 118 | hglB_1_1 | <i>Staphylococcus aureus</i> |
| 119 | hglC_2_1 | <i>Staphylococcus aureus</i> |
| 120 | hla_1_1 | <i>Staphylococcus aureus</i> |
| 121 | hlb_1_2 | <i>Staphylococcus aureus</i> |
| 122 | lukF_1_1 | <i>Staphylococcus aureus</i> |
| 123 | lukS_1_1 | <i>Staphylococcus aureus</i> |
| 124 | lukS_2_1 | <i>Staphylococcus aureus</i> |
| 125 | NAG_1_1 | <i>Staphylococcus aureus</i> |
| 126 | sak_1_1 | <i>Staphylococcus aureus</i> |
| 127 | sea_1_1 | <i>Staphylococcus aureus</i> |
| 128 | seb_1_1 | <i>Staphylococcus aureus</i> |
| 129 | sec1_1_1 | <i>Staphylococcus aureus</i> |
| 130 | seg_1_1 | <i>Staphylococcus aureus</i> |
| 131 | seh_1_1 | <i>Staphylococcus aureus</i> |
| 132 | sel_1_1 | <i>Staphylococcus aureus</i> |
| 133 | set15_1_1 | <i>Staphylococcus aureus</i> |
| 134 | set6_1_1 | <i>Staphylococcus aureus</i> |
| 135 | set7_1_1 | <i>Staphylococcus aureus</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|----------------|-----------------------------------|
| 136 | set8_1_1 | <i>Staphylococcus aureus</i> |
| 137 | sprV8_1_1 | <i>Staphylococcus aureus</i> |
| 138 | tst_1_1 | <i>Staphylococcus aureus</i> |
| 139 | I-sdrC_1_1 | <i>Staphylococcus aureus</i> |
| 140 | I-sdrD_1_1 | <i>Staphylococcus aureus</i> |
| 141 | I-sdrE_1_1 | <i>Staphylococcus aureus</i> |
| 142 | b1169_1_1 | <i>Escherichia coli</i> |
| 143 | envZ_1_1 | <i>Escherichia coli</i> |
| 144 | fliCb_1_1 | <i>Escherichia coli</i> |
| 145 | nfrB_1_1 | <i>Escherichia coli</i> |
| 146 | nlpA_1_1 | <i>Escherichia coli</i> |
| 147 | pilAe_1_1 | <i>Escherichia coli</i> |
| 148 | yacH_1_1 | <i>Escherichia coli</i> |
| 149 | yagX_1_1 | <i>Escherichia coli</i> |
| 150 | ycdS_1_1 | <i>Escherichia coli</i> |
| 151 | yciQ_1_1 | <i>Escherichia coli</i> |
| 152 | ymcA_1_1 | <i>Escherichia coli</i> |
| 153 | b1202_1_1 | <i>Escherichia coli</i> |
| 154 | eae_1_1 | <i>Escherichia coli</i> |
| 155 | eltB_1_1 | <i>Escherichia coli</i> |
| 156 | escR_1_1 | <i>Escherichia coli</i> |
| 157 | escT_1_1 | <i>Escherichia coli</i> |
| 158 | escU_1_1 | <i>Escherichia coli</i> |
| 159 | espB_1_1 | <i>Escherichia coli</i> |
| 160 | fes_1_1 | <i>Escherichia coli</i> |
| 161 | fes_2_1 | <i>Escherichia coli</i> |
| 162 | fteA_1_1 | <i>Escherichia coli</i> |
| 163 | hlyA_1_1 | <i>Escherichia coli</i> |
| 164 | hlyB_1_1 | <i>Escherichia coli</i> |
| 165 | iucA_1_1 | <i>Escherichia coli</i> |
| 166 | iucB_1_1 | <i>Escherichia coli</i> |
| 167 | iucC_1_1 | <i>Escherichia coli</i> |
| 168 | papG_1_1 | <i>Escherichia coli</i> |
| 169 | rfbE_1_1 | <i>Escherichia coli</i> |
| 170 | shuA_1_1 | <i>Escherichia coli</i> |
| 171 | SLTII_1_1 | <i>Escherichia coli</i> |
| 172 | toxA-LTPA_1_1 | <i>Escherichia coli</i> |
| 173 | VT2vaB_1_1 | <i>Escherichia coli</i> |
| 174 | ardeSE0106_1_1 | <i>Staphylococcus epidermidis</i> |
| 175 | ardeSE0107_1_1 | <i>Staphylococcus epidermidis</i> |
| 176 | aroiSE0105_1_1 | <i>Staphylococcus epidermidis</i> |
| 177 | atIE_1_1 | <i>Staphylococcus epidermidis</i> |
| 178 | agrB_1_1 | <i>Staphylococcus epidermidis</i> |
| 179 | agrC_1_1 | <i>Staphylococcus epidermidis</i> |
| 180 | alphSE1368_1_1 | <i>Staphylococcus epidermidis</i> |
| 181 | gad_1_1 | <i>Staphylococcus epidermidis</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|------------------------|-------------------------------------|
| 182 | glucSE1191_1_1 | <i>Staphylococcus epidermidis</i> |
| 183 | hsp10_1_1 | <i>Staphylococcus epidermidis</i> |
| 184 | icaA_1_1 | <i>Staphylococcus epidermidis</i> |
| 185 | icaB_1_1 | <i>Staphylococcus epidermidis</i> |
| 186 | mvaSSepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 187 | nitreSE1972_1_1 | <i>Staphylococcus epidermidis</i> |
| 188 | nitreSE1974_1_1 | <i>Staphylococcus epidermidis</i> |
| 189 | nitreSE1975_1_1 | <i>Staphylococcus epidermidis</i> |
| 190 | oiamtSE1209_1_1 | <i>Staphylococcus epidermidis</i> |
| 191 | ORF1Sepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 192 | ORF3bSepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 193 | qacR_1_1 | <i>Staphylococcus epidermidis</i> |
| 194 | sin_1_1 | <i>Staphylococcus epidermidis</i> |
| 195 | ureSE1861_1_1 | <i>Staphylococcus epidermidis</i> |
| 196 | ureSE1863_1_1 | <i>Staphylococcus epidermidis</i> |
| 197 | ureSE1864_1_1 | <i>Staphylococcus epidermidis</i> |
| 198 | ureSE1865_1_1 | <i>Staphylococcus epidermidis</i> |
| 199 | ureSE1867_1_1 | <i>Staphylococcus epidermidis</i> |
| 200 | gcaD_1_1 | <i>Staphylococcus epidermidis</i> |
| 201 | hld_orf5_1_1 | <i>Staphylococcus epidermidis</i> |
| 202 | icaC_1_1 | <i>Staphylococcus epidermidis</i> |
| 203 | icaD_1_1 | <i>Staphylococcus epidermidis</i> |
| 204 | icaR_1_1 | <i>Staphylococcus epidermidis</i> |
| 205 | psm_beta1and2_1_1 | <i>Staphylococcus epidermidis</i> |
| 206 | purR_1_1 | <i>Staphylococcus epidermidis</i> |
| 207 | spoVG_1_1 | <i>Staphylococcus epidermidis</i> |
| 208 | yabJ_1_1 | <i>Staphylococcus epidermidis</i> |
| 209 | folQShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 210 | mvaCShaemolyticus_1_1 | <i>Staphylococcus haemolyticus</i> |
| 211 | mvaDShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 212 | mvaK1Shaemolyticus_1_1 | <i>Staphylococcus haemolyticus</i> |
| 213 | mvaSShaemolyticus_1_1 | <i>Staphylococcus haemolyticus</i> |
| 214 | RNApolsigm_1_1 | <i>Staphylococcus haemolyticus</i> |
| 215 | lipShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 216 | agrB2Stalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 217 | agrC2Stalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 218 | agrCStalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 219 | slamStalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 220 | fblStalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 221 | slushABCStalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 222 | RNApolsigmSsapro_1_1 | <i>Staphylococcus saprophyticus</i> |
| 223 | RNApolsigmSsapro_1_2 | <i>Staphylococcus saprophyticus</i> |
| 224 | msrw1Stwar_1_1 | <i>Staphylococcus warneri</i> |
| 225 | nukMStwar_1_1 | <i>Staphylococcus warneri</i> |
| 226 | proDStwar_1_1 | <i>Staphylococcus warneri</i> |
| 227 | proMStwar_1_1 | <i>Staphylococcus warneri</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------------|-------------------------------|
| 228 | sigrhoStwar_1_1 | <i>Staphylococcus warneri</i> |
| 229 | tnpStwar_1_1 | <i>Staphylococcus warneri</i> |
| 230 | gehASTwar_1_1 | <i>Staphylococcus warneri</i> |
| 231 | ARG56_1_1 | <i>Candida albicans</i> |
| 232 | ASL43f_1_1 | <i>Candida albicans</i> |
| 233 | BGL2_1_1 | <i>Candida albicans</i> |
| 234 | CACHS3_1_1 | <i>Candida albicans</i> |
| 235 | CCT8_1_1 | <i>Candida albicans</i> |
| 236 | CDC37_1_1 | <i>Candida albicans</i> |
| 237 | CEF3_1_1 | <i>Candida albicans</i> |
| 238 | CHS1_1_1 | <i>Candida albicans</i> |
| 239 | CHS2_1_1 | <i>Candida albicans</i> |
| 240 | CHS4_1_1 | <i>Candida albicans</i> |
| 241 | CHS5_1_1 | <i>Candida albicans</i> |
| 242 | CHT1_1_1 | <i>Candida albicans</i> |
| 243 | CHT2_1_1 | <i>Candida albicans</i> |
| 244 | CHT4_1_1 | <i>Candida albicans</i> |
| 245 | CSA1_1_1 | <i>Candida albicans</i> |
| 246 | 5triphosphatase_1_1 | <i>Candida albicans</i> |
| 247 | AAF1_1_1 | <i>Candida albicans</i> |
| 248 | ADH1_1_1 | <i>Candida albicans</i> |
| 249 | ALS1_1_1 | <i>Candida albicans</i> |
| 250 | ALS7_1_1 | <i>Candida albicans</i> |
| 251 | EDT1_1_1 | <i>Candida albicans</i> |
| 252 | ELF_1_1 | <i>Candida albicans</i> |
| 253 | ESS1_1_1 | <i>Candida albicans</i> |
| 254 | FAL1_1_1 | <i>Candida albicans</i> |
| 255 | GAP1_1_1 | <i>Candida albicans</i> |
| 256 | GNA1_1_1 | <i>Candida albicans</i> |
| 257 | GSC1_1_1 | <i>Candida albicans</i> |
| 258 | GSL1_1_1 | <i>Candida albicans</i> |
| 259 | HIS1_1_1 | <i>Candida albicans</i> |
| 260 | HTS1_1_1 | <i>Candida albicans</i> |
| 261 | HWP1_2_1 | <i>Candida albicans</i> |
| 262 | HYR1_1_1 | <i>Candida albicans</i> |
| 263 | INT1a_1_1 | <i>Candida albicans</i> |
| 264 | KRE15f_1_1 | <i>Candida albicans</i> |
| 265 | KRE6_1_1 | <i>Candida albicans</i> |
| 266 | KRE9_1_1 | <i>Candida albicans</i> |
| 267 | MIG1_1_1 | <i>Candida albicans</i> |
| 268 | MLS1_1_1 | <i>Candida albicans</i> |
| 269 | MP65_1_1 | <i>Candida albicans</i> |
| 270 | NDE1_1_1 | <i>Candida albicans</i> |
| 271 | PFK2_1_1 | <i>Candida albicans</i> |
| 272 | PHR1_1_1 | <i>Candida albicans</i> |
| 273 | PHR2_1_1 | <i>Candida albicans</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------|------------------------------|
| 274 | PHR3_1_1 | <i>Candida albicans</i> |
| 275 | PRA1_1_1 | <i>Candida albicans</i> |
| 276 | PRS1_1_1 | <i>Candida albicans</i> |
| 277 | RBT1_1_1 | <i>Candida albicans</i> |
| 278 | RBT4_1_1 | <i>Candida albicans</i> |
| 279 | RHO1_1_1 | <i>Candida albicans</i> |
| 280 | RNR1_1_1 | <i>Candida albicans</i> |
| 281 | RPB7_1_1 | <i>Candida albicans</i> |
| 282 | RPL13_1_1 | <i>Candida albicans</i> |
| 283 | RVS167_1_1 | <i>Candida albicans</i> |
| 284 | SHA3_1_1 | <i>Candida albicans</i> |
| 285 | SKN1_1_1 | <i>Candida albicans</i> |
| 286 | SRB1_1_1 | <i>Candida albicans</i> |
| 287 | TCA1_1_1 | <i>Candida albicans</i> |
| 288 | TRP1_1_1 | <i>Candida albicans</i> |
| 289 | YAE1_1_1 | <i>Candida albicans</i> |
| 290 | YRB1_1_1 | <i>Candida albicans</i> |
| 291 | YST1exon2_1_1 | <i>Candida albicans</i> |
| 292 | CCN1_1_1 | <i>Candida albicans</i> |
| 293 | CDC28_1_1 | <i>Candida albicans</i> |
| 294 | CLN2_1_1 | <i>Candida albicans</i> |
| 295 | CPH1_1_1 | <i>Candida albicans</i> |
| 296 | CYB1_1_1 | <i>Candida albicans</i> |
| 297 | EFG1_1_1 | <i>Candida albicans</i> |
| 298 | MNT1_1_1 | <i>Candida albicans</i> |
| 299 | RBF1_1_1 | <i>Candida albicans</i> |
| 300 | RBF1_2_1 | <i>Candida albicans</i> |
| 301 | RIM101_1_1 | <i>Candida albicans</i> |
| 302 | RIM8_1_1 | <i>Candida albicans</i> |
| 303 | SEC14_1_1 | <i>Candida albicans</i> |
| 304 | SEC4_1_1 | <i>Candida albicans</i> |
| 305 | TUP1_1_1 | <i>Candida albicans</i> |
| 306 | YPT1_1_1 | <i>Candida albicans</i> |
| 307 | ZNF1CZF1_2_1 | <i>Candida albicans</i> |
| 308 | arcA_1_1 | <i>Enterococcus faecalis</i> |
| 309 | arcC_1_1 | <i>Enterococcus faecalis</i> |
| 310 | bkdA_1_1 | <i>Enterococcus faecalis</i> |
| 311 | cad_1_1 | <i>Enterococcus faecalis</i> |
| 312 | camE1_1_1 | <i>Enterococcus faecalis</i> |
| 313 | csrA_1_1 | <i>Enterococcus faecalis</i> |
| 314 | dacA_1_1 | <i>Enterococcus faecalis</i> |
| 315 | dfr_1_1 | <i>Enterococcus faecalis</i> |
| 316 | dhoD1a_1_1 | <i>Enterococcus faecalis</i> |
| 317 | ABC-eltA_1_1 | <i>Enterococcus faecalis</i> |
| 318 | agrBfs_1_1 | <i>Enterococcus faecalis</i> |
| 319 | agrCfs_1_1 | <i>Enterococcus faecalis</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|----------------|------------------------------|
| 320 | dnaE_1_1 | <i>Enterococcus faecalis</i> |
| 321 | ebsA_1_1 | <i>Enterococcus faecalis</i> |
| 322 | ebsB_1_1 | <i>Enterococcus faecalis</i> |
| 323 | eep_1_1 | <i>Enterococcus faecalis</i> |
| 324 | efaR_1_1 | <i>Enterococcus faecalis</i> |
| 325 | glS24_glsB_1_1 | <i>Enterococcus faecalis</i> |
| 326 | gph_1_1 | <i>Enterococcus faecalis</i> |
| 327 | gyrAEf_1_1 | <i>Enterococcus faecalis</i> |
| 328 | metEf_1_1 | <i>Enterococcus faecalis</i> |
| 329 | mntHCb2_1_1 | <i>Enterococcus faecalis</i> |
| 330 | mob2_1_1 | <i>Enterococcus faecalis</i> |
| 331 | mvaD_1_1 | <i>Enterococcus faecalis</i> |
| 332 | mvaE_1_1 | <i>Enterococcus faecalis</i> |
| 333 | parC_1_1 | <i>Enterococcus faecalis</i> |
| 334 | pcfG_1_1 | <i>Enterococcus faecalis</i> |
| 335 | phoZ_1_1 | <i>Enterococcus faecalis</i> |
| 336 | polC_1_1 | <i>Enterococcus faecalis</i> |
| 337 | ptb_1_1 | <i>Enterococcus faecalis</i> |
| 338 | recS1_1_1 | <i>Enterococcus faecalis</i> |
| 339 | rpoN_1_1 | <i>Enterococcus faecalis</i> |
| 340 | tms_1_1 | <i>Enterococcus faecalis</i> |
| 341 | tyrDC_1_1 | <i>Enterococcus faecalis</i> |
| 342 | tyrS_1_1 | <i>Enterococcus faecalis</i> |
| 343 | asa1_1_1 | <i>Enterococcus faecalis</i> |
| 344 | asp1_1_1 | <i>Enterococcus faecalis</i> |
| 345 | cgh_1_1 | <i>Enterococcus faecalis</i> |
| 346 | cylA_1_1 | <i>Enterococcus faecalis</i> |
| 347 | cylB_1_1 | <i>Enterococcus faecalis</i> |
| 348 | cylI_1_1 | <i>Enterococcus faecalis</i> |
| 349 | cylL_cylS_1_1 | <i>Enterococcus faecalis</i> |
| 350 | cylM_1_1 | <i>Enterococcus faecalis</i> |
| 351 | ace_1_1 | <i>Enterococcus faecalis</i> |
| 352 | ef00108_1_1 | <i>Enterococcus faecalis</i> |
| 353 | ef00109_1_1 | <i>Enterococcus faecalis</i> |
| 354 | ef0011_1_1 | <i>Enterococcus faecalis</i> |
| 355 | ef00113_1_1 | <i>Enterococcus faecalis</i> |
| 356 | ef0012_1_1 | <i>Enterococcus faecalis</i> |
| 357 | ef0022_1_1 | <i>Enterococcus faecalis</i> |
| 358 | ef0031_1_1 | <i>Enterococcus faecalis</i> |
| 359 | ef0032_1_1 | <i>Enterococcus faecalis</i> |
| 360 | ef0040_1_1 | <i>Enterococcus faecalis</i> |
| 361 | ef0058_1_1 | <i>Enterococcus faecalis</i> |
| 362 | enlA_1_1 | <i>Enterococcus faecalis</i> |
| 363 | esa_1_1 | <i>Enterococcus faecalis</i> |
| 364 | esp_1_1 | <i>Enterococcus faecalis</i> |
| 365 | gelE_1_1 | <i>Enterococcus faecalis</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------------|------------------------------|
| 366 | groEL_1_1 | <i>Enterococcus faecalis</i> |
| 367 | groES_1_1 | <i>Enterococcus faecalis</i> |
| 368 | rt1_1_1 | <i>Enterococcus faecalis</i> |
| 369 | sala_1_1 | <i>Enterococcus faecalis</i> |
| 370 | salb_1_1 | <i>Enterococcus faecalis</i> |
| 371 | sea1_1_1 | <i>Enterococcus faecalis</i> |
| 372 | sep1_1_1 | <i>Enterococcus faecalis</i> |
| 373 | vicK_1_1 | <i>Enterococcus faecalis</i> |
| 374 | yycH_1_1 | <i>Enterococcus faecalis</i> |
| 375 | yycI_1_1 | <i>Enterococcus faecalis</i> |
| 376 | yycJ_1_1 | <i>Enterococcus faecalis</i> |
| 377 | bglB_1_1 | <i>Enterococcus faecium</i> |
| 378 | bglR_1_1 | <i>Enterococcus faecium</i> |
| 379 | bglS_1_1 | <i>Enterococcus faecium</i> |
| 380 | efmA_1_1 | <i>Enterococcus faecium</i> |
| 381 | efmB_1_1 | <i>Enterococcus faecium</i> |
| 382 | efmC_1_1 | <i>Enterococcus faecium</i> |
| 383 | mreC_1_1 | <i>Enterococcus faecium</i> |
| 384 | mreD_1_1 | <i>Enterococcus faecium</i> |
| 385 | mvaDEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 386 | mvaEEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 387 | mvaK1Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 388 | mvaK2Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 389 | mvaSEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 390 | orf3_4Efaeciumb_1_1 | <i>Enterococcus faecium</i> |
| 391 | orf6_7Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 392 | orf7_8Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 393 | orf9_10Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 394 | entA_entI_1_1 | <i>Enterococcus faecium</i> |
| 395 | entD_1_1 | <i>Enterococcus faecium</i> |
| 396 | entR_1_1 | <i>Enterococcus faecium</i> |
| 397 | oep_1_1 | <i>Enterococcus faecium</i> |
| 398 | sagA_1_2 | <i>Enterococcus faecium</i> |
| 399 | atsA_1_1 | <i>Klebsiella pneumoniae</i> |
| 400 | atsB_1_1 | <i>Klebsiella pneumoniae</i> |
| 401 | budC_1_1 | <i>Klebsiella pneumoniae</i> |
| 402 | citA_1_1 | <i>Klebsiella pneumoniae</i> |
| 403 | citW_1_1 | <i>Klebsiella pneumoniae</i> |
| 404 | citX_1_1 | <i>Klebsiella pneumoniae</i> |
| 405 | dalD_1_1 | <i>Klebsiella pneumoniae</i> |
| 406 | dalK_1_1 | <i>Klebsiella pneumoniae</i> |
| 407 | dalT_1_1 | <i>Klebsiella pneumoniae</i> |
| 408 | acoA_1_1 | <i>Klebsiella pneumoniae</i> |
| 409 | acoB_1_1 | <i>Klebsiella pneumoniae</i> |
| 410 | acoC_1_1 | <i>Klebsiella pneumoniae</i> |
| 411 | ahIK_1_1 | <i>Klebsiella pneumoniae</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-------------|------------------------------|
| 412 | fimK_1_1 | <i>Klebsiella pneumoniae</i> |
| 413 | glfKPN2_1_1 | <i>Klebsiella pneumoniae</i> |
| 414 | ltrA_1_1 | <i>Klebsiella pneumoniae</i> |
| 415 | mdcC_1_1 | <i>Klebsiella pneumoniae</i> |
| 416 | mdcF_1_1 | <i>Klebsiella pneumoniae</i> |
| 417 | mdcH_1_1 | <i>Klebsiella pneumoniae</i> |
| 418 | mrkA_1_1 | <i>Klebsiella pneumoniae</i> |
| 419 | mtrK_1_1 | <i>Klebsiella pneumoniae</i> |
| 420 | nifF_1_1 | <i>Klebsiella pneumoniae</i> |
| 421 | nifK_1_1 | <i>Klebsiella pneumoniae</i> |
| 422 | nifN_1_1 | <i>Klebsiella pneumoniae</i> |
| 423 | tyrP_1_1 | <i>Klebsiella pneumoniae</i> |
| 424 | ureA_1_1 | <i>Klebsiella pneumoniae</i> |
| 425 | wbbO_1_1 | <i>Klebsiella pneumoniae</i> |
| 426 | wza_1_1 | <i>Klebsiella pneumoniae</i> |
| 427 | wzb_1_1 | <i>Klebsiella pneumoniae</i> |
| 428 | wzmKPN2_1_1 | <i>Klebsiella pneumoniae</i> |
| 429 | wztKPN2_1_1 | <i>Klebsiella pneumoniae</i> |
| 430 | yojH_1_1 | <i>Klebsiella pneumoniae</i> |
| 431 | liac_1_1 | <i>Klebsiella pneumoniae</i> |
| 432 | cim_1_1 | <i>Klebsiella pneumoniae</i> |
| 433 | aldA_1_1 | <i>Klebsiella pneumoniae</i> |
| 434 | aldA_2_1 | <i>Klebsiella pneumoniae</i> |
| 435 | hemly_1_1 | <i>Klebsiella pneumoniae</i> |
| 436 | pSL017_1_1 | <i>Klebsiella pneumoniae</i> |
| 437 | pSL020_1_1 | <i>Klebsiella pneumoniae</i> |
| 438 | rcaA_1_1 | <i>Klebsiella pneumoniae</i> |
| 439 | rmlC_1_1 | <i>Klebsiella pneumoniae</i> |
| 440 | rmlD_1_1 | <i>Klebsiella pneumoniae</i> |
| 441 | waaG_1_1 | <i>Klebsiella pneumoniae</i> |
| 442 | wbbD_1_1 | <i>Klebsiella pneumoniae</i> |
| 443 | wbbM_1_1 | <i>Klebsiella pneumoniae</i> |
| 444 | wbbN_1_1 | <i>Klebsiella pneumoniae</i> |
| 445 | wbdA_1_1 | <i>Klebsiella pneumoniae</i> |
| 446 | wbdC_1_1 | <i>Klebsiella pneumoniae</i> |
| 447 | wztKpn_1_1 | <i>Klebsiella pneumoniae</i> |
| 448 | yibD_1_1 | <i>Klebsiella pneumoniae</i> |
| 449 | cymA_1_1 | <i>Klebsiella oxytoca</i> |
| 450 | cymD_1_1 | <i>Klebsiella oxytoca</i> |
| 451 | cymE_1_1 | <i>Klebsiella oxytoca</i> |
| 452 | cymH_1_1 | <i>Klebsiella oxytoca</i> |
| 453 | cymI_1_1 | <i>Klebsiella oxytoca</i> |
| 454 | cymJ_1_1 | <i>Klebsiella oxytoca</i> |
| 455 | ddrA_1_1 | <i>Klebsiella oxytoca</i> |
| 456 | fdt-1_1_1 | <i>Klebsiella oxytoca</i> |
| 457 | fdt-2_1_1 | <i>Klebsiella oxytoca</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|------------|-------------------------------|
| 458 | fdt-3_1_1 | <i>Klebsiella oxytoca</i> |
| 459 | gatY_1_1 | <i>Klebsiella oxytoca</i> |
| 460 | hydH_1_1 | <i>Klebsiella oxytoca</i> |
| 461 | masA_1_1 | <i>Klebsiella oxytoca</i> |
| 462 | nasA_1_1 | <i>Klebsiella oxytoca</i> |
| 463 | nasE_1_1 | <i>Klebsiella oxytoca</i> |
| 464 | nasF_1_1 | <i>Klebsiella oxytoca</i> |
| 465 | pehX_1_1 | <i>Klebsiella oxytoca</i> |
| 466 | pelX_1_1 | <i>Klebsiella oxytoca</i> |
| 467 | tagH_1_1 | <i>Klebsiella oxytoca</i> |
| 468 | tagK_1_1 | <i>Klebsiella oxytoca</i> |
| 469 | tagT_1_1 | <i>Klebsiella oxytoca</i> |
| 470 | glpR_1_1 | <i>Pseudomonas aeruginosa</i> |
| 471 | lasRb_1_1 | <i>Pseudomonas aeruginosa</i> |
| 472 | OrfX_1_1 | <i>Pseudomonas aeruginosa</i> |
| 473 | pa0260_1_1 | <i>Pseudomonas aeruginosa</i> |
| 474 | pa0572_1_1 | <i>Pseudomonas aeruginosa</i> |
| 475 | pa0625_1_1 | <i>Pseudomonas aeruginosa</i> |
| 476 | pa0636_1_1 | <i>Pseudomonas aeruginosa</i> |
| 477 | pa1046_1_1 | <i>Pseudomonas aeruginosa</i> |
| 478 | pa1069_1_1 | <i>Pseudomonas aeruginosa</i> |
| 479 | pa1846_1_1 | <i>Pseudomonas aeruginosa</i> |
| 480 | pa3866_1_1 | <i>Pseudomonas aeruginosa</i> |
| 481 | pa4082_1_1 | <i>Pseudomonas aeruginosa</i> |
| 482 | pilAp_1_1 | <i>Pseudomonas aeruginosa</i> |
| 483 | PilAp2_1_1 | <i>Pseudomonas aeruginosa</i> |
| 484 | pilC_1_1 | <i>Pseudomonas aeruginosa</i> |
| 485 | PstP_1_1 | <i>Pseudomonas aeruginosa</i> |
| 486 | purK_1_1 | <i>Pseudomonas aeruginosa</i> |
| 487 | uvrDII_1_1 | <i>Pseudomonas aeruginosa</i> |
| 488 | vsmI_1_1 | <i>Pseudomonas aeruginosa</i> |
| 489 | vsmR_1_2 | <i>Pseudomonas aeruginosa</i> |
| 490 | xcpX_1_1 | <i>Pseudomonas aeruginosa</i> |
| 491 | aprA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 492 | aprE_1_1 | <i>Pseudomonas aeruginosa</i> |
| 493 | ctx_1_2 | <i>Pseudomonas aeruginosa</i> |
| 494 | algB_1_1 | <i>Pseudomonas aeruginosa</i> |
| 495 | algN_1_1 | <i>Pseudomonas aeruginosa</i> |
| 496 | algR_1_1 | <i>Pseudomonas aeruginosa</i> |
| 497 | ExoS_1_1 | <i>Pseudomonas aeruginosa</i> |
| 498 | fpvA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 499 | lasRa_1_1 | <i>Pseudomonas aeruginosa</i> |
| 500 | lipA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 501 | lipH_1_1 | <i>Pseudomonas aeruginosa</i> |
| 502 | Orf159_1_2 | <i>Pseudomonas aeruginosa</i> |
| 503 | Orf252_1_1 | <i>Pseudomonas aeruginosa</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------------|---------------------------------|
| 504 | pchG_1_1 | <i>Pseudomonas aeruginosa</i> |
| 505 | PhzA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 506 | PhzB_1_1 | <i>Pseudomonas aeruginosa</i> |
| 507 | PLC_1_1 | <i>Pseudomonas aeruginosa</i> |
| 508 | plcN_1_1 | <i>Pseudomonas aeruginosa</i> |
| 509 | plcR_1_1 | <i>Pseudomonas aeruginosa</i> |
| 510 | pvdD_1_1 | <i>Pseudomonas aeruginosa</i> |
| 511 | pvdF_1_2 | <i>Pseudomonas aeruginosa</i> |
| 512 | pyocinS1_1_1 | <i>Pseudomonas aeruginosa</i> |
| 513 | pyocinS1im_1_1 | <i>Pseudomonas aeruginosa</i> |
| 514 | pyocinS2_1_1 | <i>Pseudomonas aeruginosa</i> |
| 515 | pys2_1_1 | <i>Pseudomonas aeruginosa</i> |
| 516 | pys2_2_1 | <i>Pseudomonas aeruginosa</i> |
| 517 | rbf303_1_1 | <i>Pseudomonas aeruginosa</i> |
| 518 | rhIA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 519 | rhIB_1_1 | <i>Pseudomonas aeruginosa</i> |
| 520 | rhIR_1_1 | <i>Pseudomonas aeruginosa</i> |
| 521 | TnAP41_1_2 | <i>Pseudomonas aeruginosa</i> |
| 522 | toxA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 523 | cap1EStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 524 | cap1FStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 525 | cap1GStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 526 | cap3AStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 527 | cap3BStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 528 | celAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 529 | celBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 530 | cglAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 531 | cglBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 532 | cglCStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 533 | cglDStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 534 | cinA_1_1 | <i>Streptococcus pneumoniae</i> |
| 535 | cps14EStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 536 | cps14FStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 537 | cps14GStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 538 | cps14HStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 539 | cps19aHStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 540 | cps19aIStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 541 | cps19aKStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 542 | cps19fGStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 543 | cps23fGStrpneum_1_1 | <i>Streptococcus pneumoniae</i> |
| 544 | dexB_1_1 | <i>Streptococcus pneumoniae</i> |
| 545 | dinF_1_1 | <i>Streptococcus pneumoniae</i> |
| 546 | 1760Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 547 | acyPStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 548 | endAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 549 | exoAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|------------------------|---------------------------------|
| 550 | exp72_1_1 | <i>Streptococcus pneumoniae</i> |
| 551 | fnlAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 552 | fnlBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 553 | fnlCStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 554 | gct18Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 555 | hexB1_1_1 | <i>Streptococcus pneumoniae</i> |
| 556 | hftsHstrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 557 | immunofrag1Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 558 | immunofrag2Strpneu_2_1 | <i>Streptococcus pneumoniae</i> |
| 559 | immunofrag3Strpneu_2_1 | <i>Streptococcus pneumoniae</i> |
| 560 | kdtBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 561 | lysAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 562 | pcpBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 563 | pflCStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 564 | plpA_1_1 | <i>Streptococcus pneumoniae</i> |
| 565 | prtA1Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 566 | pspC1Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 567 | pspC2_1_1 | <i>Streptococcus pneumoniae</i> |
| 568 | purRStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 569 | pyrDAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 570 | SP0828Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 571 | SP0830Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 572 | SP0833Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 573 | SP0837_38Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 574 | SP0839Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 575 | ugdStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 576 | uncC_1_1 | <i>Streptococcus pneumoniae</i> |
| 577 | vicXStrepneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 578 | wchA6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 579 | wci4Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 580 | wciK4Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 581 | wciL4Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 582 | wciN6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 583 | wciO6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 584 | wciP6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 585 | wciY18Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 586 | wzdbStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 587 | wze6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 588 | wzy18Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 589 | wzy4Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 590 | wzy6bStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 591 | xpt_1_1 | <i>Streptococcus pneumoniae</i> |
| 592 | igaStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 593 | lytA_1_1 | <i>Streptococcus pneumoniae</i> |
| 594 | nanA_1_1 | <i>Streptococcus pneumoniae</i> |
| 595 | nanBStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-------------------|---------------------------------|
| 596 | pcpCStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 597 | ply_1_1 | <i>Streptococcus pneumoniae</i> |
| 598 | prtAStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 599 | pspA_1_2 | <i>Streptococcus pneumoniae</i> |
| 600 | SP0834Strpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 601 | SP0834Strpneu_1_2 | <i>Streptococcus pneumoniae</i> |
| 602 | sphtraStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 603 | wciJStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 604 | wziYStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 605 | wzxStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 606 | cpsA1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 607 | cpsB1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 608 | cpsC1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 609 | cpsD1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 610 | cpsE1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 611 | cpsG1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 612 | cpsI1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 613 | cpsJ1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 614 | cpsK1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 615 | cpsM1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 616 | cpsY1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 617 | cpsY2Strgal_2_1 | <i>Streptococcus agalactiae</i> |
| 618 | cylB1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 619 | cylE1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 620 | cylF1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 621 | cylH1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 622 | cylI1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 623 | cylJ1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 624 | cylK1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 625 | 0487Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 626 | 0488Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 627 | 0493Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 628 | 0495Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 629 | 0498Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 630 | 0500Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 631 | 0502Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 632 | 0504Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 633 | fold1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 634 | neuA1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 635 | neuB1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 636 | neuC1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 637 | neuD1Strgal_1_1 | <i>Streptococcus agalactiae</i> |
| 638 | recN1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 639 | ileS1Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 640 | CAMPfactor_1_1 | <i>Streptococcus agalactiae</i> |
| 641 | CAMPfactor_2_1 | <i>Streptococcus agalactiae</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-------------------------|---------------------------------|
| 642 | 0499Straga_1_1 | <i>Streptococcus agalactiae</i> |
| 643 | hylStragal_1_1 | <i>Streptococcus agalactiae</i> |
| 644 | lipStragal_1_1 | <i>Streptococcus agalactiae</i> |
| 645 | cyclStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 646 | fah_rph_hlo_Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 647 | int_1_1 | <i>Streptococcus pyogenes</i> |
| 648 | int315.5_1_1 | <i>Streptococcus pyogenes</i> |
| 649 | murEStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 650 | oppA_1_1 | <i>Streptococcus pyogenes</i> |
| 651 | oppCStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 652 | oppD_1_1 | <i>Streptococcus pyogenes</i> |
| 653 | SPy0382Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 654 | SPy0390Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 655 | SpyM3_1351_1_1 | <i>Streptococcus pyogenes</i> |
| 656 | vicXStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 657 | DNaseIStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 658 | fba2Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 659 | fhuAStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 660 | fhuB1Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 661 | fhuDStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 662 | fhuGStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 663 | hyla_1_1 | <i>Streptococcus pyogenes</i> |
| 664 | hyIP_1_1 | <i>Streptococcus pyogenes</i> |
| 665 | hyIP2_1_1 | <i>Streptococcus pyogenes</i> |
| 666 | oppB_1_1 | <i>Streptococcus pyogenes</i> |
| 667 | ropB_1_1 | <i>Streptococcus pyogenes</i> |
| 668 | scpAStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 669 | sloStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 670 | smez-4Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 671 | sof_1_1 | <i>Streptococcus pyogenes</i> |
| 672 | sof_2_1 | <i>Streptococcus pyogenes</i> |
| 673 | speA_1_1 | <i>Streptococcus pyogenes</i> |
| 674 | speB2Strpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 675 | speCStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 676 | speJStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 677 | srtBStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 678 | srtCStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 679 | srtEStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 680 | srtFStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 681 | srtGStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 682 | srtIStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 683 | srtKStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 684 | srtRStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 685 | srtTStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 686 | vickStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 687 | 573Stprmut_1_1 | <i>Streptococcus viridans</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|---------------------|-------------------------------|
| 688 | 580SStprmut_1_1 | <i>Streptococcus viridans</i> |
| 689 | 581_582SStprmut_1_1 | <i>Streptococcus viridans</i> |
| 690 | 584SStprmut_1_1 | <i>Streptococcus viridans</i> |
| 691 | dltAStrmut_1_1 | <i>Streptococcus viridans</i> |
| 692 | dltBStrmut_1_1 | <i>Streptococcus viridans</i> |
| 693 | dltCpx1Strmut_1_1 | <i>Streptococcus viridans</i> |
| 694 | dltDStrmut_1_1 | <i>Streptococcus viridans</i> |
| 695 | lichStrbov_1_1 | <i>Streptococcus viridans</i> |
| 696 | lytRStprmut_1_1 | <i>Streptococcus viridans</i> |
| 697 | lytSStprmut_1_1 | <i>Streptococcus viridans</i> |
| 698 | pepQStrrmut_1_1 | <i>Streptococcus viridans</i> |
| 699 | pflCStrmut_1_1 | <i>Streptococcus viridans</i> |
| 700 | recNStprmut_1_1 | <i>Streptococcus viridans</i> |
| 701 | ytqBStrmut_1_1 | <i>Streptococcus viridans</i> |
| 702 | hlyXStrmut_1_1 | <i>Streptococcus viridans</i> |
| 703 | igaStrmitis_1_1 | <i>Streptococcus viridans</i> |
| 704 | igaStrsanguis_1_1 | <i>Streptococcus viridans</i> |
| 705 | perMStrmut_1_1 | <i>Streptococcus viridans</i> |
| 706 | atfA_1_1 | <i>Proteus mirabilis</i> |
| 707 | atfB_1_1 | <i>Proteus mirabilis</i> |
| 708 | atfC_1_1 | <i>Proteus mirabilis</i> |
| 709 | ccmPrmi1_1_1 | <i>Proteus mirabilis</i> |
| 710 | cyaPrmi_1_1 | <i>Proteus mirabilis</i> |
| 711 | aad_1_1 | <i>Proteus mirabilis</i> |
| 712 | flfB_1_1 | <i>Proteus mirabilis</i> |
| 713 | flfD_1_1 | <i>Proteus mirabilis</i> |
| 714 | flfN_1_1 | <i>Proteus mirabilis</i> |
| 715 | flhD_1_1 | <i>Proteus mirabilis</i> |
| 716 | floA_1_1 | <i>Proteus mirabilis</i> |
| 717 | ftsK_1_1 | <i>Proteus mirabilis</i> |
| 718 | gstB_1_1 | <i>Proteus mirabilis</i> |
| 719 | hemCPrmi_1_1 | <i>Proteus mirabilis</i> |
| 720 | hemDPrmi_1_1 | <i>Proteus mirabilis</i> |
| 721 | hev_1_1 | <i>Proteus mirabilis</i> |
| 722 | katA_1_1 | <i>Proteus mirabilis</i> |
| 723 | lpp1_1_1 | <i>Proteus mirabilis</i> |
| 724 | menE_1_1 | <i>Proteus mirabilis</i> |
| 725 | mfd_1_1 | <i>Proteus mirabilis</i> |
| 726 | nrpA_1_1 | <i>Proteus mirabilis</i> |
| 727 | nrpB_1_1 | <i>Proteus mirabilis</i> |
| 728 | nrpG_1_1 | <i>Proteus mirabilis</i> |
| 729 | nrpS_1_1 | <i>Proteus mirabilis</i> |
| 730 | nrpT_1_1 | <i>Proteus mirabilis</i> |
| 731 | nrpU_1_1 | <i>Proteus mirabilis</i> |
| 732 | pat_1_1 | <i>Proteus mirabilis</i> |
| 733 | pmfA_1_1 | <i>Proteus mirabilis</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|--------------|--------------------------|
| 734 | pmfC_1_1 | <i>Proteus mirabilis</i> |
| 735 | pmfE_1_1 | <i>Proteus mirabilis</i> |
| 736 | ppaA_1_1 | <i>Proteus mirabilis</i> |
| 737 | rsbA_1_1 | <i>Proteus mirabilis</i> |
| 738 | rsbC_1_1 | <i>Proteus mirabilis</i> |
| 739 | speB_1_1 | <i>Proteus mirabilis</i> |
| 740 | stmA_1_1 | <i>Proteus mirabilis</i> |
| 741 | stmB_1_1 | <i>Proteus mirabilis</i> |
| 742 | terA_1_1 | <i>Proteus mirabilis</i> |
| 743 | terD_1_1 | <i>Proteus mirabilis</i> |
| 744 | umoA_1_1 | <i>Proteus mirabilis</i> |
| 745 | umoB_1_1 | <i>Proteus mirabilis</i> |
| 746 | umoC_1_1 | <i>Proteus mirabilis</i> |
| 747 | ureR_1_1 | <i>Proteus mirabilis</i> |
| 748 | xerC_1_1 | <i>Proteus mirabilis</i> |
| 749 | ygbA_1_1 | <i>Proteus mirabilis</i> |
| 750 | flaA_1_1 | <i>Proteus mirabilis</i> |
| 751 | flaD_1_1 | <i>Proteus mirabilis</i> |
| 752 | fliA_1_1 | <i>Proteus mirabilis</i> |
| 753 | hpmA_1_1 | <i>Proteus mirabilis</i> |
| 754 | hpmB_1_1 | <i>Proteus mirabilis</i> |
| 755 | lpsPrmi_1_1 | <i>Proteus mirabilis</i> |
| 756 | mrpA_1_1 | <i>Proteus mirabilis</i> |
| 757 | mrpB_1_1 | <i>Proteus mirabilis</i> |
| 758 | mrpC_1_1 | <i>Proteus mirabilis</i> |
| 759 | mrpD_1_1 | <i>Proteus mirabilis</i> |
| 760 | mrpE_1_1 | <i>Proteus mirabilis</i> |
| 761 | mrpF_1_1 | <i>Proteus mirabilis</i> |
| 762 | mrpG_1_1 | <i>Proteus mirabilis</i> |
| 763 | mrpH_1_1 | <i>Proteus mirabilis</i> |
| 764 | mrpI_1_1 | <i>Proteus mirabilis</i> |
| 765 | mrpJ_1_1 | <i>Proteus mirabilis</i> |
| 766 | patA_1_1 | <i>Proteus mirabilis</i> |
| 767 | putA_1_1 | <i>Proteus mirabilis</i> |
| 768 | uca_1_1 | <i>Proteus mirabilis</i> |
| 769 | ureDPrmi_1_1 | <i>Proteus mirabilis</i> |
| 770 | ureEPrmi_1_1 | <i>Proteus mirabilis</i> |
| 771 | ureFPrmi_1_1 | <i>Proteus mirabilis</i> |
| 772 | zapA_1_1 | <i>Proteus mirabilis</i> |
| 773 | zapB_1_1 | <i>Proteus mirabilis</i> |
| 774 | zapD_1_1 | <i>Proteus mirabilis</i> |
| 775 | zapE_1_1 | <i>Proteus mirabilis</i> |
| 776 | envZPrvu_1_1 | <i>Proteus vulgaris</i> |
| 777 | frdC_1_1 | <i>Proteus vulgaris</i> |
| 778 | frdD_1_1 | <i>Proteus vulgaris</i> |
| 779 | infBPrvu_1_1 | <i>Proteus vulgaris</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|--------------------|------------------------------------|
| 780 | lad_1_1 | <i>Proteus vulgaris</i> |
| 781 | tna2_1_1 | <i>Proteus vulgaris</i> |
| 782 | end_1_1 | <i>Proteus vulgaris</i> |
| 783 | pqrA_1_1 | <i>Proteus vulgaris</i> |
| 784 | urg_1_1 | <i>Proteus vulgaris</i> |
| 785 | blaIMP-7_1_1 | <i>Pseudomonas aeruginosa</i> |
| 786 | mecISepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 787 | blaOXA-10_1_2 | <i>Pseudomonas aeruginosa</i> |
| 788 | blaB_1_1 | <i>Proteus vulgaris</i> |
| 789 | ampC_1_1 | <i>Klebsiella oxytoca</i> |
| 790 | I-blaR_1_1 | <i>Staphylococcus aureus</i> |
| 791 | blaOXA-32_1_1 | <i>Pseudomonas aeruginosa</i> |
| 792 | bla-CTX-M-22_1_1 | <i>Klebsiella pneumoniae</i> |
| 793 | pbp2aStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 794 | blaSHV-1_1_1 | <i>Klebsiella pneumoniae</i> |
| 795 | blaOXA-2_1_1 | <i>Salmonella typhimurium</i> |
| 796 | blaRShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 797 | blaIMP-7_1_2 | <i>Pseudomonas aeruginosa</i> |
| 798 | I-mecR_1_1 | <i>Staphylococcus aureus</i> |
| 799 | blaOXY_1_1 | <i>Klebsiella oxytoca</i> |
| 800 | dacCStrpyog_1_1 | <i>Streptococcus pyogenes</i> |
| 801 | femA_1_1 | <i>Staphylococcus aureus</i> |
| 802 | mecA_1_1 | <i>Staphylococcus aureus</i> |
| 803 | blaIShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 804 | blavim_1_1 | <i>Pseudomonas aeruginosa</i> |
| 805 | pbp2b_1_1 | <i>Streptococcus pneumoniae</i> |
| 806 | pbp2primeSepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 807 | pbp2x_1_1 | <i>Streptococcus pneumoniae</i> |
| 808 | pbp3Saureuc_1_1 | <i>Staphylococcus aureus</i> |
| 809 | pbp4_1_1 | <i>Enterococcus faecalis</i> |
| 810 | pbp5Efaecium_1_1 | <i>Enterococcus faecium</i> |
| 811 | pbpC_1_1 | <i>Enterococcus faecalis</i> |
| 812 | I-mecI_1_1 | <i>Staphylococcus aureus</i> |
| 813 | pbp1a_1_1 | <i>Streptococcus pneumoniae</i> |
| 814 | I-blaI_1_1 | <i>Staphylococcus aureus</i> |
| 815 | blaTEM-106_1_1 | <i>Escherichia coli</i> |
| 816 | blaOXY-KLOX_1_1 | <i>Klebsiella oxytoca</i> |
| 817 | ftsWEF_1_1 | <i>Enterococcus faecium</i> |
| 818 | fmhB_1_1 | <i>Staphylococcus aureus</i> |
| 819 | cumA_1_1 | <i>Proteus vulgaris</i> |
| 820 | femBShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 821 | blaPER-1_1_1 | <i>Pseudomonas aeruginosa</i> |
| 822 | bla_FOX-3_1_1 | <i>Klebsiella oxytoca</i> |
| 823 | blaA_1_1 | <i>Proteus vulgaris</i> |
| 824 | psrb_1_1 | <i>Enterococcus faecium</i> |
| 825 | fmhA_1_1 | <i>Staphylococcus aureus</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|--------------------|-----------------------------------|
| 826 | mecR1Sepid_1_1 | <i>Staphylococcus epidermidis</i> |
| 827 | blaZ_1_1 | <i>Staphylococcus aureus</i> |
| 828 | blaOXA-1_1_1 | Plasmid RGN238 |
| 829 | fox-6_1_1 | <i>Klebsiella pneumoniae</i> |
| 830 | blaPrmi_1_1 | <i>Proteus mirabilis</i> |
| 831 | aacA_aphDStwar_1_1 | <i>Staphylococcus warneri</i> |
| 832 | aacC1_1_2 | <i>Pseudomonas aeruginosa</i> |
| 833 | aacC2_1_1 | <i>Escherichia coli</i> |
| 834 | strB_1_1 | <i>Escherichia coli</i> |
| 835 | aadA_1_1 | <i>Enterococcus faecalis</i> |
| 836 | aadB_1_2 | <i>Escherichia coli</i> |
| 837 | aadD_1_1 | <i>Staphylococcus aureus</i> |
| 838 | aacA4_1_2 | <i>Pseudomonas aeruginosa</i> |
| 839 | strA_1_1 | <i>Escherichia coli</i> |
| 840 | aph-A3_1_1 | <i>Staphylococcus aureus</i> |
| 841 | aacC1_1_1 | <i>Pseudomonas aeruginosa</i> |
| 842 | aacA4_1_1 | <i>Pseudomonas aeruginosa</i> |
| 843 | aacA-aphD_1_1 | <i>Staphylococcus aureus</i> |
| 844 | I-spc_1_1 | <i>Staphylococcus aureus</i> |
| 845 | aphA3_1_1 | synthetic construct |
| 846 | ermC_1_1 | <i>Staphylococcus aureus</i> |
| 847 | linB_1_1 | <i>Enterococcus faecium</i> |
| 848 | satSA_1_1 | <i>Staphylococcus aureus</i> |
| 849 | mdrSA_1_1 | <i>Staphylococcus aureus</i> |
| 850 | I-linA_1_1 | <i>Staphylococcus aureus</i> |
| 851 | ermB_1_2 | <i>Staphylococcus aureus</i> |
| 852 | ermA_1_1 | <i>Staphylococcus aureus</i> |
| 853 | satA_1_1 | <i>Enterococcus faecium</i> |
| 854 | msrA_1_1 | <i>Staphylococcus aureus</i> |
| 855 | mphBM_1_1 | <i>Staphylococcus aureus</i> |
| 856 | mefA_1_1 | <i>Streptococcus pyogenes</i> |
| 857 | mrX_1_1 | <i>Escherichia coli</i> |
| 858 | dfrStrpneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 859 | dfrA_1_1 | <i>Staphylococcus aureus</i> |
| 860 | cmlA5_1_1 | <i>Escherichia coli</i> |
| 861 | catEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 862 | cat_1_1 | <i>Staphylococcus aureus</i> |
| 863 | tetAJ_1_1 | <i>Proteus mirabilis</i> |
| 864 | tetL_1_1 | <i>Enterococcus faecalis</i> |
| 865 | tetM_1_1 | <i>Enterococcus faecalis</i> |
| 866 | vanH(tn)_1_1 | <i>Enterococcus faecium</i> |
| 867 | vanA_1_1 | <i>Enterococcus faecium</i> |
| 868 | vanHB2_1_1 | <i>Enterococcus faecium</i> |
| 869 | vanR_1_1 | <i>Enterococcus faecium</i> |
| 870 | vanRB2_1_1 | <i>Enterococcus faecium</i> |
| 871 | vanS(tn)_1_1 | <i>Enterococcus faecium</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-----------------|-----------------------------------|
| 872 | vanSB2_1_1 | <i>Enterococcus faecium</i> |
| 873 | vanWB2_1_1 | <i>Enterococcus faecium</i> |
| 874 | ddl_1_1 | <i>Enterococcus faecalis</i> |
| 875 | ble_1_1 | <i>Staphylococcus aureus</i> |
| 876 | vanXB2_1_1 | <i>Enterococcus faecium</i> |
| 877 | vanY(tn)_1_1 | <i>Enterococcus faecium</i> |
| 878 | vanYB2_1_1 | <i>Enterococcus faecium</i> |
| 879 | vanB_1_1 | <i>Enterococcus faecalis</i> |
| 880 | vanZ(tn)_1_1 | <i>Enterococcus faecium</i> |
| 881 | vanC-2_1_1 | <i>Enterococcus flavescens</i> |
| 882 | vanX(tn)_1_1 | <i>Enterococcus faecium</i> |
| 883 | acrB_1_1 | <i>Proteus mirabilis</i> |
| 884 | mexB_1_2 | <i>Pseudomonas aeruginosa</i> |
| 885 | I-qacA_1_1 | <i>Staphylococcus aureus</i> |
| 886 | sulI_1_1 | <i>Escherichia coli</i> |
| 887 | sul_1_1 | <i>Escherichia coli</i> |
| 888 | cadBStalugd_1_1 | <i>Staphylococcus lugdunensis</i> |
| 889 | mexA_1_1 | <i>Pseudomonas aeruginosa</i> |
| 890 | acrR_1_1 | <i>Proteus mirabilis</i> |
| 891 | emeA_1_1 | <i>Enterococcus faecalis</i> |
| 892 | acrA_1_1 | <i>Proteus mirabilis</i> |
| 893 | rtn_1_1 | <i>Proteus vulgaris</i> |
| 894 | abcXStrpmut_1_1 | <i>Streptococcus mutans</i> |
| 895 | qacEdelta1_1_1 | <i>Escherichia coli</i> |
| 896 | elkT-abcA_1_1 | <i>Staphylococcus aureus</i> |
| 897 | I-cadA_1_1 | <i>Staphylococcus aureus</i> |
| 898 | albA_1_1 | <i>Klebsiella oxytoca</i> |
| 899 | wzm_1_1 | <i>Klebsiella pneumoniae</i> |
| 900 | msrCb_1_1 | <i>Enterococcus faecium</i> |
| 901 | nov_1_1 | <i>Escherichia coli</i> |
| 902 | wzt_1_1 | <i>Klebsiella pneumoniae</i> |
| 903 | wbbI_1_1 | <i>Klebsiella pneumoniae</i> |
| 904 | norA23_1_1 | <i>Staphylococcus aureus</i> |
| 905 | mexR_1_1 | <i>Pseudomonas aeruginosa</i> |
| 906 | arr2_1_1 | <i>Escherichia coli</i> |
| 907 | mreA_1_1 | <i>Staphylococcus aureus</i> |
| 908 | I-cadC_1_1 | <i>Staphylococcus aureus</i> |
| 909 | uvrA_1_1 | <i>Enterococcus faecalis</i> |
| 910 | CRD2_1_1 | <i>Candida albicans</i> |
| 911 | CDR1_1_1 | <i>Candida albicans</i> |
| 912 | CDR1_2_1 | <i>Candida albicans</i> |
| 913 | MET3_1_1 | <i>Candida albicans</i> |
| 914 | FET3_1_1 | <i>Candida albicans</i> |
| 915 | FTR2_1_1 | <i>Candida albicans</i> |
| 916 | MDR1-7_1_1 | <i>Candida albicans</i> |
| 917 | ERG11_1_1 | <i>Candida albicans</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-------------------------|------------------------------------|
| 918 | SEC20_1_1 | <i>Candida albicans</i> |
| 919 | rbcl_1_1 | <i>Glycine max</i> |
| 920 | LDHA(hu)_1_1 | <i>Homo sapiens</i> |
| 921 | GAPD(hu)_1_1 | <i>Homo sapiens</i> |
| 922 | b-Act(hu)_1_1 | <i>Homo sapiens</i> |
| 923 | ARHGDIA(hu)_1_1 | <i>Homo sapiens</i> |
| 924 | PGK1(hu)_1_1 | <i>Homo sapiens</i> |
| 925 | rbcl_1_2 | <i>Glycine max</i> |
| 926 | 16SPa_1_1 | <i>Pseudomonas aeruginosa</i> |
| 927 | 23SEfaecium_2_1 | <i>Enterococcus faecium</i> |
| 928 | 16SSStrepyog_1_1 | <i>Streptococcus pyogenes</i> |
| 929 | 16SSStrepneu_1_1 | <i>Streptococcus pneumoniae</i> |
| 930 | 16SSStrepagalactiae_1_1 | <i>Streptococcus agalactiae</i> |
| 931 | 16SEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 932 | 16SEfaecium_2_1 | <i>Enterococcus faecium</i> |
| 933 | 16SRNAEf_2_1 | <i>Enterococcus faecalis</i> |
| 934 | 16SKpn_1_1 | <i>Klebsiella pneumoniae</i> |
| 935 | 16SSa_3_1 | <i>Staphylococcus aureus</i> |
| 936 | 16SRNAEf_1_1 | <i>Enterococcus faecalis</i> |
| 937 | 16SShominis_1_1 | <i>Staphylococcus hominis</i> |
| 938 | 16SShaemolyt_1_1 | <i>Staphylococcus haemolyticus</i> |
| 939 | 23SEfaecium_1_1 | <i>Enterococcus faecium</i> |
| 940 | 16SrRNAPrmi_1_1 | <i>Proteus mirabilis</i> |
| 941 | 16SrRNAPrvu1_1_1 | <i>Proteus vulgaris</i> |
| 942 | 16SSa_1_1 | <i>Staphylococcus aureus</i> |
| 943 | 16SKlox_1_1 | <i>Klebsiella oxytoca</i> |
| 944 | p53_1_1 | <i>Mus musculus</i> |
| 945 | 0135mihck_1_1 | <i>Dictyostelium discoideum</i> |
| 946 | FAN_1_1 | <i>Mus musculus</i> |
| 947 | 0270cap_1_1 | <i>Dictyostelium discoideum</i> |
| 2842 | 16SSStrepdysgal_1_1 | <i>Streptococcus dysgalactiae</i> |
| 2843 | carO_1_1 | <i>Acinetobacter baumannii</i> |
| 2844 | gacS_1_1 | <i>Acinetobacter baumannii</i> |
| 2845 | dhbA_1_1 | <i>Acinetobacter baumannii</i> |
| 2846 | dhbB_1_1 | <i>Acinetobacter baumannii</i> |
| 2847 | sid_1_1 | <i>Acinetobacter baumannii</i> |
| 2848 | csuD_1_1 | <i>Acinetobacter baumannii</i> |
| 2849 | csuC_1_1 | <i>Acinetobacter baumannii</i> |
| 2850 | tnp-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2851 | waaA-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2852 | csuB_1_1 | <i>Acinetobacter baumannii</i> |
| 2853 | csuA_B_1_1 | <i>Acinetobacter baumannii</i> |
| 2854 | csuA_1_1 | <i>Acinetobacter baumannii</i> |
| 2855 | put1_1_1 | <i>Acinetobacter baumannii</i> |
| 2856 | por_1_1 | <i>Acinetobacter baumannii</i> |
| 2857 | abc_1_1 | <i>Acinetobacter baumannii</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-----------------|-------------------------------------|
| 2858 | furACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2859 | dec_1_1 | <i>Acinetobacter baumannii</i> |
| 2860 | cysI_1_1 | <i>Acinetobacter baumannii</i> |
| 2861 | trpE_1_1 | <i>Acinetobacter baumannii</i> |
| 2862 | put3_1_1 | <i>Acinetobacter baumannii</i> |
| 2863 | ompA-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2864 | aacA4ENCL_1_1 | <i>Enterobacter cloacae</i> |
| 2865 | AdeR-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2866 | adeA-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2867 | aac(6p)-lb7_1_1 | <i>Enterobacter cloacae</i> |
| 2868 | adeB-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2869 | adeC-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2870 | AdeS-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2871 | blaL2_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2872 | blaMIR-3_1_1 | <i>Enterobacter cloacae</i> |
| 2873 | ampR_1_1 | <i>Enterobacter cloacae</i> |
| 2874 | ampC-ENCL_1_1 | <i>Enterobacter cloacae</i> |
| 2875 | blaL1_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2876 | asr_1_1 | <i>Enterobacter cloacae</i> |
| 2877 | lacZ_1_1 | <i>Enterobacter cloacae</i> |
| 2878 | ehuS_1_1 | <i>Enterobacter cloacae</i> |
| 2879 | ehuV_1_1 | <i>Enterobacter cloacae</i> |
| 2880 | slyA_1_1 | <i>Enterobacter cloacae</i> |
| 2881 | ORF165_1_1 | <i>Enterobacter cloacae</i> |
| 2882 | ehuU_1_1 | <i>Enterobacter cloacae</i> |
| 2883 | ehuT_1_1 | <i>Enterobacter cloacae</i> |
| 2884 | ORF295_1_1 | <i>Enterobacter cloacae</i> |
| 2885 | ehuA_1_1 | <i>Enterobacter cloacae</i> |
| 2886 | ORF400_1_1 | <i>Enterobacter cloacae</i> |
| 2887 | H+ATPase_1_1 | <i>Enterococcus faecium</i> |
| 2888 | sulII_1_1 | <i>Acinetobacter baumannii</i> |
| 2889 | smeE_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2890 | eE_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2891 | StmPr1_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2892 | eD_2_1 | <i>Stenotrophomonas maltophilia</i> |
| 2893 | ppi_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2894 | pmp-STEMA_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2895 | pam_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2896 | ORF4-STEMA_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2897 | ORF2-STEMA_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2898 | et_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2899 | eF_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2900 | StmPr2_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2901 | smeF4494_1_1 | <i>Stenotrophomonas maltophilia</i> |
| 2902 | coa_3_1 | <i>Staphylococcus aureus</i> |
| 2903 | coa_2_2 | <i>Staphylococcus aureus</i> |

| SEQ ID NO | Probe name | Template source |
|-----------|-------------------|-----------------------------------|
| 2904 | fasCAXStrdysg_1_1 | <i>Streptococcus dysgalactiae</i> |
| 2905 | sloStrep_1_1 | <i>Streptococcus dysgalactiae</i> |
| 2906 | ydhK_1_1 | <i>Staphylococcus hominis</i> |
| 2907 | tetA-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |
| 2908 | tetR-ACIBA_1_1 | <i>Acinetobacter baumannii</i> |

b) primer sequences

| SEQ ID NO | Probe name | Direction |
|-----------|--------------|-----------|
| 948 | cataSaur_1_1 | F(orward) |
| 949 | cataSaur_1_1 | R(everse) |
| 950 | cataSaur_1_2 | F |
| 951 | cataSaur_1_2 | R |
| 952 | clfA_1_1 | F |
| 953 | clfA_1_1 | R |
| 954 | clfB_1_1 | F |
| 955 | clfB_1_1 | R |
| 956 | coa_1_1 | F |
| 957 | coa_1_1 | R |
| 958 | coa_1_2 | F |
| 959 | coa_1_2 | R |
| 960 | I-clpC_1_1 | F |
| 961 | I-clpC_1_1 | R |
| 962 | I-clpP_1_1 | F |
| 963 | I-clpP_1_1 | R |
| 964 | I-ctaA_1_1 | F |
| 965 | I-ctaA_1_1 | R |
| 966 | I-ctsR_1_1 | F |
| 967 | I-ctsR_1_1 | R |
| 968 | I-dltA_1_1 | F |
| 969 | I-dltA_1_1 | R |
| 970 | I-dltB_1_1 | F |
| 971 | I-dltB_1_1 | R |
| 972 | I-dltC_1_1 | F |
| 973 | I-dltC_1_1 | R |
| 974 | I-dnaK_1_1 | F |
| 975 | I-dnaK_1_1 | R |
| 976 | I-elkT_1_1 | F |
| 977 | I-elkT_1_1 | R |
| 978 | I-femD_1_1 | F |
| 979 | I-femD_1_1 | R |
| 980 | I-glnA_1_1 | F |
| 981 | I-glnA_1_1 | R |
| 982 | I-glnR_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 983 | I-glnR_1_1 | R |
| 984 | I-grlA_1_1 | F |
| 985 | I-grlA_1_1 | R |
| 986 | I-grlB_1_1 | F |
| 987 | I-grlB_1_1 | R |
| 988 | I-groEL_1_1 | F |
| 989 | I-groEL_1_1 | R |
| 990 | I-groES_1_1 | F |
| 991 | I-groES_1_1 | R |
| 992 | I-hemA_1_1 | F |
| 993 | I-hemA_1_1 | R |
| 994 | I-hemE_1_1 | F |
| 995 | I-hemE_1_1 | R |
| 996 | I-hemH_1_1 | F |
| 997 | I-hemH_1_1 | R |
| 998 | I-hemL_1_1 | F |
| 999 | I-hemL_1_1 | R |
| 1000 | I-hemY_1_1 | F |
| 1001 | I-hemY_1_1 | R |
| 1002 | I-lepA_1_1 | F |
| 1003 | I-lepA_1_1 | R |
| 1004 | I-lrgA_1_1 | F |
| 1005 | I-lrgA_1_1 | R |
| 1006 | I-lrgB_1_1 | F |
| 1007 | I-lrgB_1_1 | R |
| 1008 | I-lytM_1_1 | F |
| 1009 | I-lytM_1_1 | R |
| 1010 | I-menB_1_1 | F |
| 1011 | I-menB_1_1 | R |
| 1012 | I-menD_1_1 | F |
| 1013 | I-menD_1_1 | R |
| 1014 | I-menE_1_1 | F |
| 1015 | I-menE_1_1 | R |
| 1016 | I-menF_1_1 | F |
| 1017 | I-menF_1_1 | R |
| 1018 | I-mreB_1_1 | F |
| 1019 | I-mreB_1_1 | R |
| 1020 | I-mreR_1_1 | F |
| 1021 | I-mreR_1_1 | R |
| 1022 | I-mutL_1_1 | F |
| 1023 | I-mutL_1_1 | R |
| 1024 | I-mutS_1_1 | F |
| 1025 | I-mutS_1_1 | R |
| 1026 | I-NAG_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|---------------|-----------|
| 1027 | I-NAG_1_1 | R |
| 1028 | I-pbg_1_1 | F |
| 1029 | I-pbg_1_1 | R |
| 1030 | I-pbpF_1_1 | F |
| 1031 | I-pbpF_1_1 | R |
| 1032 | I-pdhB_1_1 | F |
| 1033 | I-pdhB_1_1 | R |
| 1034 | I-pdhC_1_1 | F |
| 1035 | I-pdhC_1_1 | R |
| 1036 | I-rsbU_1_1 | F |
| 1037 | I-rsbU_1_1 | R |
| 1038 | I-rsbV_1_1 | F |
| 1039 | I-rsbV_1_1 | R |
| 1040 | I-rsbW_1_1 | F |
| 1041 | I-rsbW_1_1 | R |
| 1042 | I-sgp_1_1 | F |
| 1043 | I-sgp_1_1 | R |
| 1044 | I-sirR_1_1 | F |
| 1045 | I-sirR_1_1 | R |
| 1046 | I-sodA_1_1 | F |
| 1047 | I-sodA_1_1 | R |
| 1048 | I-sodB_1_1 | F |
| 1049 | I-sodB_1_1 | R |
| 1050 | I-sstA_1_1 | F |
| 1051 | I-sstA_1_1 | R |
| 1052 | I-sstB_1_1 | F |
| 1053 | I-sstB_1_1 | R |
| 1054 | I-sstC_1_1 | F |
| 1055 | I-sstC_1_1 | R |
| 1056 | I-sstD_1_1 | F |
| 1057 | I-sstD_1_1 | R |
| 1058 | I-trx_1_1 | F |
| 1059 | I-trx_1_1 | R |
| 1060 | I-yhiN_1_1 | F |
| 1061 | I-yhiN_1_1 | R |
| 1062 | epiP-bsaP_1_1 | F |
| 1063 | epiP-bsaP_1_1 | R |
| 1064 | geh_1_1 | F |
| 1065 | geh_1_1 | R |
| 1066 | gyrA_1_1 | F |
| 1067 | gyrA_1_1 | R |
| 1068 | gyrB_1_1 | F |
| 1069 | gyrB_1_1 | R |
| 1070 | hemB_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1071 | hemB_1_1 | R |
| 1072 | hemC_1_1 | F |
| 1073 | hemC_1_1 | R |
| 1074 | hemD_1_1 | F |
| 1075 | hemD_1_1 | R |
| 1076 | hemN_1_1 | F |
| 1077 | hemN_1_1 | R |
| 1078 | hsdS_1_1 | F |
| 1079 | hsdS_1_1 | R |
| 1080 | hsdS_2_1 | F |
| 1081 | hsdS_2_1 | R |
| 1082 | lip_1_1 | F |
| 1083 | lip_1_1 | R |
| 1084 | menC_1_1 | F |
| 1085 | menC_1_1 | R |
| 1086 | murC_1_1 | F |
| 1087 | murC_1_1 | R |
| 1088 | nuc_1_1 | F |
| 1089 | nuc_1_1 | R |
| 1090 | pdhD_1_1 | F |
| 1091 | pdhD_1_1 | R |
| 1092 | rpoB_1_1 | F |
| 1093 | rpoB_1_1 | R |
| 1094 | SAV0431_1_1 | F |
| 1095 | SAV0431_1_1 | R |
| 1096 | SAV0439_1_1 | F |
| 1097 | SAV0439_1_1 | R |
| 1098 | SAV0440_1_1 | F |
| 1099 | SAV0440_1_1 | R |
| 1100 | SAV0441_1_1 | F |
| 1101 | SAV0441_1_1 | R |
| 1102 | sigB_1_1 | F |
| 1103 | sigB_1_1 | R |
| 1104 | spa_1_2 | F |
| 1105 | spa_1_2 | R |
| 1106 | sstC_1_1 | F |
| 1107 | sstC_1_1 | R |
| 1108 | tag_1_1 | F |
| 1109 | tag_1_1 | R |
| 1110 | tyrA_1_1 | F |
| 1111 | tyrA_1_1 | R |
| 1112 | I-aroC_1_1 | F |
| 1113 | I-aroC_1_1 | R |
| 1114 | I-aroA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1115 | I-aroA_1_1 | R |
| 1116 | I-cna_1_1 | F |
| 1117 | I-cna_1_1 | R |
| 1118 | I-ebpS_1_1 | F |
| 1119 | I-ebpS_1_1 | R |
| 1120 | I-eno_1_1 | F |
| 1121 | I-eno_1_1 | R |
| 1122 | I-fbpA_1_1 | F |
| 1123 | I-fbpA_1_1 | R |
| 1124 | I-fib_1_1 | F |
| 1125 | I-fib_1_1 | R |
| 1126 | I-fnbB_1_1 | F |
| 1127 | I-fnbB_1_1 | R |
| 1128 | I-srtA_1_1 | F |
| 1129 | I-srtA_1_1 | R |
| 1130 | I-stpC_1_1 | F |
| 1131 | I-stpC_1_1 | R |
| 1132 | I-fnbA_1_1 | F |
| 1133 | I-fnbA_1_1 | R |
| 1134 | I-spa_1_1 | F |
| 1135 | I-spa_1_1 | R |
| 1136 | I-aroE_1_1 | F |
| 1137 | I-aroE_1_1 | R |
| 1138 | I-aroF_1_1 | F |
| 1139 | I-aroF_1_1 | R |
| 1140 | I-aroG_1_1 | F |
| 1141 | I-aroG_1_1 | R |
| 1142 | I-asp23_1_1 | F |
| 1143 | I-asp23_1_1 | R |
| 1144 | I-atl_1_1 | F |
| 1145 | I-atl_1_1 | R |
| 1146 | bsaE_1_1 | F |
| 1147 | bsaE_1_1 | R |
| 1148 | bsaG_1_1 | F |
| 1149 | bsaG_1_1 | R |
| 1150 | cap5h_1_1 | F |
| 1151 | cap5h_1_1 | R |
| 1152 | cap5i_1_1 | F |
| 1153 | cap5i_1_1 | R |
| 1154 | cap5j_1_1 | F |
| 1155 | cap5j_1_1 | R |
| 1156 | cap5k_1_1 | F |
| 1157 | cap5k_1_1 | R |
| 1158 | cap8H_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|-------------|-----------|
| 1159 | cap8H_1_1 | R |
| 1160 | cap8I_1_1 | F |
| 1161 | cap8I_1_1 | R |
| 1162 | cap8J_1_1 | F |
| 1163 | cap8J_1_1 | R |
| 1164 | cap8K_1_1 | F |
| 1165 | cap8K_1_1 | R |
| 1166 | I-hld_1_1 | F |
| 1167 | I-hld_1_1 | R |
| 1168 | I-hysA_1_1 | F |
| 1169 | I-hysA_1_1 | R |
| 1170 | I-IgGbg_1_1 | F |
| 1171 | I-IgGbg_1_1 | R |
| 1172 | EDIN_1_1 | F |
| 1173 | EDIN_1_1 | R |
| 1174 | eta_1_1 | F |
| 1175 | eta_1_1 | R |
| 1176 | etb_1_1 | F |
| 1177 | etb_1_1 | R |
| 1178 | hglA_1_1 | F |
| 1179 | hglA_1_1 | R |
| 1180 | hglA_2_1 | F |
| 1181 | hglA_2_1 | R |
| 1182 | hglB_1_1 | F |
| 1183 | hglB_1_1 | R |
| 1184 | hglC_2_1 | F |
| 1185 | hglC_2_1 | R |
| 1186 | hla_1_1 | F |
| 1187 | hla_1_1 | R |
| 1188 | hlb_1_2 | F |
| 1189 | hlb_1_2 | R |
| 1190 | lukF_1_1 | F |
| 1191 | lukF_1_1 | R |
| 1192 | lukS_1_1 | F |
| 1193 | lukS_1_1 | R |
| 1194 | lukS_2_1 | F |
| 1195 | lukS_2_1 | R |
| 1196 | NAG_1_1 | F |
| 1197 | NAG_1_1 | R |
| 1198 | sak_1_1 | F |
| 1199 | sak_1_1 | R |
| 1200 | sea_1_1 | F |
| 1201 | sea_1_1 | R |
| 1202 | seb_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1203 | seb_1_1 | R |
| 1204 | sec1_1_1 | F |
| 1205 | sec1_1_1 | R |
| 1206 | seg_1_1 | F |
| 1207 | seg_1_1 | R |
| 1208 | seh_1_1 | F |
| 1209 | seh_1_1 | R |
| 1210 | sel_1_1 | F |
| 1211 | sel_1_1 | R |
| 1212 | set15_1_1 | F |
| 1213 | set15_1_1 | R |
| 1214 | set6_1_1 | F |
| 1215 | set6_1_1 | R |
| 1216 | set7_1_1 | F |
| 1217 | set7_1_1 | R |
| 1218 | set8_1_1 | F |
| 1219 | set8_1_1 | R |
| 1220 | sprV8_1_1 | F |
| 1221 | sprV8_1_1 | R |
| 1222 | tst_1_1 | F |
| 1223 | tst_1_1 | R |
| 1224 | I-sdrC_1_1 | F |
| 1225 | I-sdrC_1_1 | R |
| 1226 | I-sdrD_1_1 | F |
| 1227 | I-sdrD_1_1 | R |
| 1228 | I-sdrE_1_1 | F |
| 1229 | I-sdrE_1_1 | R |
| 1230 | b1169_1_1 | F |
| 1231 | b1169_1_1 | R |
| 1232 | envZ_1_1 | F |
| 1233 | envZ_1_1 | R |
| 1234 | fliCb_1_1 | F |
| 1235 | fliCb_1_1 | R |
| 1236 | nfrB_1_1 | F |
| 1237 | nfrB_1_1 | R |
| 1238 | nlpA_1_1 | F |
| 1239 | nlpA_1_1 | R |
| 1240 | pilAe_1_1 | F |
| 1241 | pilAe_1_1 | R |
| 1242 | yacH_1_1 | F |
| 1243 | yacH_1_1 | R |
| 1244 | yagX_1_1 | F |
| 1245 | yagX_1_1 | R |
| 1246 | ycdS_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1247 | ycdS_1_1 | R |
| 1248 | yciQ_1_1 | F |
| 1249 | yciQ_1_1 | R |
| 1250 | ymcA_1_1 | F |
| 1251 | ymcA_1_1 | R |
| 1252 | b1202_1_1 | F |
| 1253 | b1202_1_1 | R |
| 1254 | eae_1_1 | F |
| 1255 | eae_1_1 | R |
| 1256 | eltB_1_1 | F |
| 1257 | eltB_1_1 | R |
| 1258 | escR_1_1 | F |
| 1259 | escR_1_1 | R |
| 1260 | escT_1_1 | F |
| 1261 | escT_1_1 | R |
| 1262 | escU_1_1 | F |
| 1263 | escU_1_1 | R |
| 1264 | espB_1_1 | F |
| 1265 | espB_1_1 | R |
| 1266 | fes_1_1 | F |
| 1267 | fes_1_1 | R |
| 1268 | fes_2_1 | F |
| 1269 | fes_2_1 | R |
| 1270 | fteA_1_1 | F |
| 1271 | fteA_1_1 | R |
| 1272 | hlyA_1_1 | F |
| 1273 | hlyA_1_1 | R |
| 1274 | hlyB_1_1 | F |
| 1275 | hlyB_1_1 | R |
| 1276 | iucA_1_1 | F |
| 1277 | iucA_1_1 | R |
| 1278 | iucB_1_1 | F |
| 1279 | iucB_1_1 | R |
| 1280 | iucC_1_1 | F |
| 1281 | iucC_1_1 | R |
| 1282 | papG_1_1 | F |
| 1283 | papG_1_1 | R |
| 1284 | rfbE_1_1 | F |
| 1285 | rfbE_1_1 | R |
| 1286 | shuA_1_1 | F |
| 1287 | shuA_1_1 | R |
| 1288 | SLTII_1_1 | F |
| 1289 | SLTII_1_1 | R |
| 1290 | toxA-LTPA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|-----------------|-----------|
| 1291 | toxA-LTPA_1_1 | R |
| 1292 | VT2vaB_1_1 | F |
| 1293 | VT2vaB_1_1 | R |
| 1294 | ardeSE0106_1_1 | F |
| 1295 | ardeSE0106_1_1 | R |
| 1296 | ardeSE0107_1_1 | F |
| 1297 | ardeSE0107_1_1 | R |
| 1298 | aroISE0105_1_1 | F |
| 1299 | aroISE0105_1_1 | R |
| 1300 | atIE_1_1 | F |
| 1301 | atIE_1_1 | R |
| 1302 | agrB_1_1 | F |
| 1303 | agrB_1_1 | R |
| 1304 | agrC_1_1 | F |
| 1305 | agrC_1_1 | R |
| 1306 | alphSE1368_1_1 | F |
| 1307 | alphSE1368_1_1 | R |
| 1308 | gad_1_1 | F |
| 1309 | gad_1_1 | R |
| 1310 | glucSE1191_1_1 | F |
| 1311 | glucSE1191_1_1 | R |
| 1312 | hsp10_1_1 | F |
| 1313 | hsp10_1_1 | R |
| 1314 | icaA_1_1 | F |
| 1315 | icaA_1_1 | R |
| 1316 | icaB_1_1 | F |
| 1317 | icaB_1_1 | R |
| 1318 | mvaSSepid_1_1 | F |
| 1319 | mvaSSepid_1_1 | R |
| 1320 | nitreSE1972_1_1 | F |
| 1321 | nitreSE1972_1_1 | R |
| 1322 | nitreSE1974_1_1 | F |
| 1323 | nitreSE1974_1_1 | R |
| 1324 | nitreSE1975_1_1 | F |
| 1325 | nitreSE1975_1_1 | R |
| 1326 | oiamtSE1209_1_1 | F |
| 1327 | oiamtSE1209_1_1 | R |
| 1328 | ORF1Sepid_1_1 | F |
| 1329 | ORF1Sepid_1_1 | R |
| 1330 | ORF3bSepid_1_1 | F |
| 1331 | ORF3bSepid_1_1 | R |
| 1332 | qacR_1_1 | F |
| 1333 | qacR_1_1 | R |
| 1334 | sin_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|------------------------|-----------|
| 1335 | sin_1_1 | R |
| 1336 | ureSE1861_1_1 | F |
| 1337 | ureSE1861_1_1 | R |
| 1338 | ureSE1863_1_1 | F |
| 1339 | ureSE1863_1_1 | R |
| 1340 | ureSE1864_1_1 | F |
| 1341 | ureSE1864_1_1 | R |
| 1342 | ureSE1865_1_1 | F |
| 1343 | ureSE1865_1_1 | R |
| 1344 | ureSE1867_1_1 | F |
| 1345 | ureSE1867_1_1 | R |
| 1346 | gcaD_1_1 | F |
| 1347 | gcaD_1_1 | R |
| 1348 | hld_orf5_1_1 | F |
| 1349 | hld_orf5_1_1 | R |
| 1350 | icaC_1_1 | F |
| 1351 | icaC_1_1 | R |
| 1352 | icaD_1_1 | F |
| 1353 | icaD_1_1 | R |
| 1354 | icaR_1_1 | F |
| 1355 | icaR_1_1 | R |
| 1356 | psm_beta1and2_1_1 | F |
| 1357 | psm_beta1and2_1_1 | R |
| 1358 | purR_1_1 | F |
| 1359 | purR_1_1 | R |
| 1360 | spoVG_1_1 | F |
| 1361 | spoVG_1_1 | R |
| 1362 | yabJ_1_1 | F |
| 1363 | yabJ_1_1 | R |
| 1364 | folQShaemolyt_1_1 | F |
| 1365 | folQShaemolyt_1_1 | R |
| 1366 | mvaCShaemolyticus_1_1 | F |
| 1367 | mvaCShaemolyticus_1_1 | R |
| 1368 | mvaDShaemolyt_1_1 | F |
| 1369 | mvaDShaemolyt_1_1 | R |
| 1370 | mvaK1Shaemolyticus_1_1 | F |
| 1371 | mvaK1Shaemolyticus_1_1 | R |
| 1372 | mvaSShaemolyticus_1_1 | F |
| 1373 | mvaSShaemolyticus_1_1 | R |
| 1374 | RNApolsigm_1_1 | F |
| 1375 | RNApolsigm_1_1 | R |
| 1376 | lipShaemolyt_1_1 | F |
| 1377 | lipShaemolyt_1_1 | R |
| 1378 | agrB2Stalugd_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|----------------------|------------------|
| 1379 | agrB2Stalugd_1_1 | R |
| 1380 | agrC2Stalugd_1_1 | F |
| 1381 | agrC2Stalugd_1_1 | R |
| 1382 | agrCStalugd_1_1 | F |
| 1383 | agrCStalugd_1_1 | R |
| 1384 | slamStalugd_1_1 | F |
| 1385 | slamStalugd_1_1 | R |
| 1386 | fblStalugd_1_1 | F |
| 1387 | fblStalugd_1_1 | R |
| 1388 | slushABCStalugd_1_1 | F |
| 1389 | slushABCStalugd_1_1 | R |
| 1390 | RNApolsigmSsapro_1_1 | F |
| 1391 | RNApolsigmSsapro_1_1 | R |
| 1392 | RNApolsigmSsapro_1_2 | F |
| 1393 | RNApolsigmSsapro_1_2 | R |
| 1394 | msrw1Stwar_1_1 | F |
| 1395 | msrw1Stwar_1_1 | R |
| 1396 | nukMStwar_1_1 | F |
| 1397 | nukMStwar_1_1 | R |
| 1398 | proDStwar_1_1 | F |
| 1399 | proDStwar_1_1 | R |
| 1400 | proMStwar_1_1 | F |
| 1401 | proMStwar_1_1 | R |
| 1402 | sigrpoStwar_1_1 | F |
| 1403 | sigrpoStwar_1_1 | R |
| 1404 | tnpStwar_1_1 | F |
| 1405 | tnpStwar_1_1 | R |
| 1406 | gehAStwar_1_1 | F |
| 1407 | gehAStwar_1_1 | R |
| 1408 | ARG56_1_1 | F |
| 1409 | ARG56_1_1 | R |
| 1410 | ASL43f_1_1 | F |
| 1411 | ASL43f_1_1 | R |
| 1412 | BGL2_1_1 | F |
| 1413 | BGL2_1_1 | R |
| 1414 | CACHS3_1_1 | F |
| 1415 | CACHS3_1_1 | R |
| 1416 | CCT8_1_1 | F |
| 1417 | CCT8_1_1 | R |
| 1418 | CDC37_1_1 | F |
| 1419 | CDC37_1_1 | R |
| 1420 | CEF3_1_1 | F |
| 1421 | CEF3_1_1 | R |
| 1422 | CHS1_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|---------------------|------------------|
| 1423 | CHS1_1_1 | R |
| 1424 | CHS2_1_1 | F |
| 1425 | CHS2_1_1 | R |
| 1426 | CHS4_1_1 | F |
| 1427 | CHS4_1_1 | R |
| 1428 | CHS5_1_1 | F |
| 1429 | CHS5_1_1 | R |
| 1430 | CHT1_1_1 | F |
| 1431 | CHT1_1_1 | R |
| 1432 | CHT2_1_1 | F |
| 1433 | CHT2_1_1 | R |
| 1434 | CHT4_1_1 | F |
| 1435 | CHT4_1_1 | R |
| 1436 | CSA1_1_1 | F |
| 1437 | CSA1_1_1 | R |
| 1438 | 5triphosphatase_1_1 | F |
| 1439 | 5triphosphatase_1_1 | R |
| 1440 | AAF1_1_1 | F |
| 1441 | AAF1_1_1 | R |
| 1442 | ADH1_1_1 | F |
| 1443 | ADH1_1_1 | R |
| 1444 | ALS1_1_1 | F |
| 1445 | ALS1_1_1 | R |
| 1446 | ALS7_1_1 | F |
| 1447 | ALS7_1_1 | R |
| 1448 | EDT1_1_1 | F |
| 1449 | EDT1_1_1 | R |
| 1450 | ELF_1_1 | F |
| 1451 | ELF_1_1 | R |
| 1452 | ESS1_1_1 | F |
| 1453 | ESS1_1_1 | R |
| 1454 | FAL1_1_1 | F |
| 1455 | FAL1_1_1 | R |
| 1456 | GAP1_1_1 | F |
| 1457 | GAP1_1_1 | R |
| 1458 | GNA1_1_1 | F |
| 1459 | GNA1_1_1 | R |
| 1460 | GSC1_1_1 | F |
| 1461 | GSC1_1_1 | R |
| 1462 | GSL1_1_1 | F |
| 1463 | GSL1_1_1 | R |
| 1464 | HIS1_1_1 | F |
| 1465 | HIS1_1_1 | R |
| 1466 | HTS1_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1467 | HTS1_1_1 | R |
| 1468 | HWP1_2_1 | F |
| 1469 | HWP1_2_1 | R |
| 1470 | HYR1_1_1 | F |
| 1471 | HYR1_1_1 | R |
| 1472 | INT1a_1_1 | F |
| 1473 | INT1a_1_1 | R |
| 1474 | KRE15f_1_1 | F |
| 1475 | KRE15f_1_1 | R |
| 1476 | KRE6_1_1 | F |
| 1477 | KRE6_1_1 | R |
| 1478 | KRE9_1_1 | F |
| 1479 | KRE9_1_1 | R |
| 1480 | MIG1_1_1 | F |
| 1481 | MIG1_1_1 | R |
| 1482 | MLS1_1_1 | F |
| 1483 | MLS1_1_1 | R |
| 1484 | MP65_1_1 | F |
| 1485 | MP65_1_1 | R |
| 1486 | NDE1_1_1 | F |
| 1487 | NDE1_1_1 | R |
| 1488 | PFK2_1_1 | F |
| 1489 | PFK2_1_1 | R |
| 1490 | PHR1_1_1 | F |
| 1491 | PHR1_1_1 | R |
| 1492 | PHR2_1_1 | F |
| 1493 | PHR2_1_1 | R |
| 1494 | PHR3_1_1 | F |
| 1495 | PHR3_1_1 | R |
| 1496 | PRA1_1_1 | F |
| 1497 | PRA1_1_1 | R |
| 1498 | PRS1_1_1 | F |
| 1499 | PRS1_1_1 | R |
| 1500 | RBT1_1_1 | F |
| 1501 | RBT1_1_1 | R |
| 1502 | RBT4_1_1 | F |
| 1503 | RBT4_1_1 | R |
| 1504 | RHO1_1_1 | F |
| 1505 | RHO1_1_1 | R |
| 1506 | RNR1_1_1 | F |
| 1507 | RNR1_1_1 | R |
| 1508 | RPB7_1_1 | F |
| 1509 | RPB7_1_1 | R |
| 1510 | RPL13_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1511 | RPL13_1_1 | R |
| 1512 | RVS167_1_1 | F |
| 1513 | RVS167_1_1 | R |
| 1514 | SHA3_1_1 | F |
| 1515 | SHA3_1_1 | R |
| 1516 | SKN1_1_1 | F |
| 1517 | SKN1_1_1 | R |
| 1518 | SRB1_1_1 | F |
| 1519 | SRB1_1_1 | R |
| 1520 | TCA1_1_1 | F |
| 1521 | TCA1_1_1 | R |
| 1522 | TRP1_1_1 | F |
| 1523 | TRP1_1_1 | R |
| 1524 | YAE1_1_1 | F |
| 1525 | YAE1_1_1 | R |
| 1526 | YRB1_1_1 | F |
| 1527 | YRB1_1_1 | R |
| 1528 | YST1exon2_1_1 | F |
| 1529 | YST1exon2_1_1 | R |
| 1530 | CCN1_1_1 | F |
| 1531 | CCN1_1_1 | R |
| 1532 | CDC28_1_1 | F |
| 1533 | CDC28_1_1 | R |
| 1534 | CLN2_1_1 | F |
| 1535 | CLN2_1_1 | R |
| 1536 | CPH1_1_1 | F |
| 1537 | CPH1_1_1 | R |
| 1538 | CYB1_1_1 | F |
| 1539 | CYB1_1_1 | R |
| 1540 | EFG1_1_1 | F |
| 1541 | EFG1_1_1 | R |
| 1542 | MNT1_1_1 | F |
| 1543 | MNT1_1_1 | R |
| 1544 | RBF1_1_1 | F |
| 1545 | RBF1_1_1 | R |
| 1546 | RBF1_2_1 | F |
| 1547 | RBF1_2_1 | R |
| 1548 | RIM101_1_1 | F |
| 1549 | RIM101_1_1 | R |
| 1550 | RIM8_1_1 | F |
| 1551 | RIM8_1_1 | R |
| 1552 | SEC14_1_1 | F |
| 1553 | SEC14_1_1 | R |
| 1554 | SEC4_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1555 | SEC4_1_1 | R |
| 1556 | TUP1_1_1 | F |
| 1557 | TUP1_1_1 | R |
| 1558 | YPT1_1_1 | F |
| 1559 | YPT1_1_1 | R |
| 1560 | ZNF1CZF1_2_1 | F |
| 1561 | ZNF1CZF1_2_1 | R |
| 1562 | arcA_1_1 | F |
| 1563 | arcA_1_1 | R |
| 1564 | arcC_1_1 | F |
| 1565 | arcC_1_1 | R |
| 1566 | bkdA_1_1 | F |
| 1567 | bkdA_1_1 | R |
| 1568 | cad_1_1 | F |
| 1569 | cad_1_1 | R |
| 1570 | camE1_1_1 | F |
| 1571 | camE1_1_1 | R |
| 1572 | csrA_1_1 | F |
| 1573 | csrA_1_1 | R |
| 1574 | dacA_1_1 | F |
| 1575 | dacA_1_1 | R |
| 1576 | dfr_1_1 | F |
| 1577 | dfr_1_1 | R |
| 1578 | dhoD1a_1_1 | F |
| 1579 | dhoD1a_1_1 | R |
| 1580 | ABC-eltA_1_1 | F |
| 1581 | ABC-eltA_1_1 | R |
| 1582 | agrBfs_1_1 | F |
| 1583 | agrBfs_1_1 | R |
| 1584 | agrCfs_1_1 | F |
| 1585 | agrCfs_1_1 | R |
| 1586 | dnaE_1_1 | F |
| 1587 | dnaE_1_1 | R |
| 1588 | ebsA_1_1 | F |
| 1589 | ebsA_1_1 | R |
| 1590 | ebsB_1_1 | F |
| 1591 | ebsB_1_1 | R |
| 1592 | eep_1_1 | F |
| 1593 | eep_1_1 | R |
| 1594 | efaR_1_1 | F |
| 1595 | efaR_1_1 | R |
| 1596 | gls24_glsB_1_1 | F |
| 1597 | gls24_glsB_1_1 | R |
| 1598 | gph_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1599 | gph_1_1 | R |
| 1600 | gyrAEf_1_1 | F |
| 1601 | gyrAEf_1_1 | R |
| 1602 | metEf_1_1 | F |
| 1603 | metEf_1_1 | R |
| 1604 | mntHCb2_1_1 | F |
| 1605 | mntHCb2_1_1 | R |
| 1606 | mob2_1_1 | F |
| 1607 | mob2_1_1 | R |
| 1608 | mvaD_1_1 | F |
| 1609 | mvaD_1_1 | R |
| 1610 | mvaE_1_1 | F |
| 1611 | mvaE_1_1 | R |
| 1612 | parC_1_1 | F |
| 1613 | parC_1_1 | R |
| 1614 | pcfG_1_1 | F |
| 1615 | pcfG_1_1 | R |
| 1616 | phoZ_1_1 | F |
| 1617 | phoZ_1_1 | R |
| 1618 | polC_1_1 | F |
| 1619 | polC_1_1 | R |
| 1620 | ptb_1_1 | F |
| 1621 | ptb_1_1 | R |
| 1622 | recS1_1_1 | F |
| 1623 | recS1_1_1 | R |
| 1624 | rpoN_1_1 | F |
| 1625 | rpoN_1_1 | R |
| 1626 | tms_1_1 | F |
| 1627 | tms_1_1 | R |
| 1628 | tyrDC_1_1 | F |
| 1629 | tyrDC_1_1 | R |
| 1630 | tyrS_1_1 | F |
| 1631 | tyrS_1_1 | R |
| 1632 | asa1_1_1 | F |
| 1633 | asa1_1_1 | R |
| 1634 | asp1_1_1 | F |
| 1635 | asp1_1_1 | R |
| 1636 | cgh_1_1 | F |
| 1637 | cgh_1_1 | R |
| 1638 | cylA_1_1 | F |
| 1639 | cylA_1_1 | R |
| 1640 | cylB_1_1 | F |
| 1641 | cylB_1_1 | R |
| 1642 | cylI_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1643 | cylI_1_1 | R |
| 1644 | cylL_cylS_1_1 | F |
| 1645 | cylL_cylS_1_1 | R |
| 1646 | cylM_1_1 | F |
| 1647 | cylM_1_1 | R |
| 1648 | ace_1_1 | F |
| 1649 | ace_1_1 | R |
| 1650 | ef00108_1_1 | F |
| 1651 | ef00108_1_1 | R |
| 1652 | ef00109_1_1 | F |
| 1653 | ef00109_1_1 | R |
| 1654 | ef0011_1_1 | F |
| 1655 | ef0011_1_1 | R |
| 1656 | ef00113_1_1 | F |
| 1657 | ef00113_1_1 | R |
| 1658 | ef0012_1_1 | F |
| 1659 | ef0012_1_1 | R |
| 1660 | ef0022_1_1 | F |
| 1661 | ef0022_1_1 | R |
| 1662 | ef0031_1_1 | F |
| 1663 | ef0031_1_1 | R |
| 1664 | ef0032_1_1 | F |
| 1665 | ef0032_1_1 | R |
| 1666 | ef0040_1_1 | F |
| 1667 | ef0040_1_1 | R |
| 1668 | ef0058_1_1 | F |
| 1669 | ef0058_1_1 | R |
| 1670 | enlA_1_1 | F |
| 1671 | enlA_1_1 | R |
| 1672 | esa_1_1 | F |
| 1673 | esa_1_1 | R |
| 1674 | esp_1_1 | F |
| 1675 | esp_1_1 | R |
| 1676 | gelE_1_1 | F |
| 1677 | gelE_1_1 | R |
| 1678 | groEL_1_1 | F |
| 1679 | groEL_1_1 | R |
| 1680 | groES_1_1 | F |
| 1681 | groES_1_1 | R |
| 1682 | rt1_1_1 | F |
| 1683 | rt1_1_1 | R |
| 1684 | sala_1_1 | F |
| 1685 | sala_1_1 | R |
| 1686 | salb_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|---------------------|------------------|
| 1687 | salb_1_1 | R |
| 1688 | sea1_1_1 | F |
| 1689 | sea1_1_1 | R |
| 1690 | sep1_1_1 | F |
| 1691 | sep1_1_1 | R |
| 1692 | vicK_1_1 | F |
| 1693 | vicK_1_1 | R |
| 1694 | yycH_1_1 | F |
| 1695 | yycH_1_1 | R |
| 1696 | yycI_1_1 | F |
| 1697 | yycI_1_1 | R |
| 1698 | yycJ_1_1 | F |
| 1699 | yycJ_1_1 | R |
| 1700 | bglB_1_1 | F |
| 1701 | bglB_1_1 | R |
| 1702 | bglR_1_1 | F |
| 1703 | bglR_1_1 | R |
| 1704 | bglS_1_1 | F |
| 1705 | bglS_1_1 | R |
| 1706 | efmA_1_1 | F |
| 1707 | efmA_1_1 | R |
| 1708 | efmB_1_1 | F |
| 1709 | efmB_1_1 | R |
| 1710 | efmC_1_1 | F |
| 1711 | efmC_1_1 | R |
| 1712 | mreC_1_1 | F |
| 1713 | mreC_1_1 | R |
| 1714 | mreD_1_1 | F |
| 1715 | mreD_1_1 | R |
| 1716 | mvaDEfaecium_1_1 | F |
| 1717 | mvaDEfaecium_1_1 | R |
| 1718 | mvaEEfaecium_1_1 | F |
| 1719 | mvaEEfaecium_1_1 | R |
| 1720 | mvaK1Efaecium_1_1 | F |
| 1721 | mvaK1Efaecium_1_1 | R |
| 1722 | mvaK2Efaecium_1_1 | F |
| 1723 | mvaK2Efaecium_1_1 | R |
| 1724 | mvaSEfaecium_1_1 | F |
| 1725 | mvaSEfaecium_1_1 | R |
| 1726 | orf3_4Efaeciumb_1_1 | F |
| 1727 | orf3_4Efaeciumb_1_1 | R |
| 1728 | orf6_7Efaecium_1_1 | F |
| 1729 | orf6_7Efaecium_1_1 | R |
| 1730 | orf7_8Efaecium_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|---------------------|------------------|
| 1731 | orf7_8Efaecium_1_1 | R |
| 1732 | orf9_10Efaecium_1_1 | F |
| 1733 | orf9_10Efaecium_1_1 | R |
| 1734 | entA_entI_1_1 | F |
| 1735 | entA_entI_1_1 | R |
| 1736 | entD_1_1 | F |
| 1737 | entD_1_1 | R |
| 1738 | entR_1_1 | F |
| 1739 | entR_1_1 | R |
| 1740 | oep_1_1 | F |
| 1741 | oep_1_1 | R |
| 1742 | sagA_1_2 | F |
| 1743 | sagA_1_2 | R |
| 1744 | atsA_1_1 | F |
| 1745 | atsA_1_1 | R |
| 1746 | atsB_1_1 | F |
| 1747 | atsB_1_1 | R |
| 1748 | budC_1_1 | F |
| 1749 | budC_1_1 | R |
| 1750 | citA_1_1 | F |
| 1751 | citA_1_1 | R |
| 1752 | citW_1_1 | F |
| 1753 | citW_1_1 | R |
| 1754 | citX_1_1 | F |
| 1755 | citX_1_1 | R |
| 1756 | dalD_1_1 | F |
| 1757 | dalD_1_1 | R |
| 1758 | dalk_1_1 | F |
| 1759 | dalk_1_1 | R |
| 1760 | dalT_1_1 | F |
| 1761 | dalT_1_1 | R |
| 1762 | acoA_1_1 | F |
| 1763 | acoA_1_1 | R |
| 1764 | acoB_1_1 | F |
| 1765 | acoB_1_1 | R |
| 1766 | acoC_1_1 | F |
| 1767 | acoC_1_1 | R |
| 1768 | ahlK_1_1 | F |
| 1769 | ahlK_1_1 | R |
| 1770 | fimK_1_1 | F |
| 1771 | fimK_1_1 | R |
| 1772 | glfKPN2_1_1 | F |
| 1773 | glfKPN2_1_1 | R |
| 1774 | ltrA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1775 | ltrA_1_1 | R |
| 1776 | mdcC_1_1 | F |
| 1777 | mdcC_1_1 | R |
| 1778 | mdcF_1_1 | F |
| 1779 | mdcF_1_1 | R |
| 1780 | mdcH_1_1 | F |
| 1781 | mdcH_1_1 | R |
| 1782 | mrkA_1_1 | F |
| 1783 | mrkA_1_1 | R |
| 1784 | mtrK_1_1 | F |
| 1785 | mtrK_1_1 | R |
| 1786 | nifF_1_1 | F |
| 1787 | nifF_1_1 | R |
| 1788 | nifK_1_1 | F |
| 1789 | nifK_1_1 | R |
| 1790 | nifN_1_1 | F |
| 1791 | nifN_1_1 | R |
| 1792 | tyrP_1_1 | F |
| 1793 | tyrP_1_1 | R |
| 1794 | ureA_1_1 | F |
| 1795 | ureA_1_1 | R |
| 1796 | wbbO_1_1 | F |
| 1797 | wbbO_1_1 | R |
| 1798 | wza_1_1 | F |
| 1799 | wza_1_1 | R |
| 1800 | wzb_1_1 | F |
| 1801 | wzb_1_1 | R |
| 1802 | wzmKPN2_1_1 | F |
| 1803 | wzmKPN2_1_1 | R |
| 1804 | wztKPN2_1_1 | F |
| 1805 | wztKPN2_1_1 | R |
| 1806 | yojH_1_1 | F |
| 1807 | yojH_1_1 | R |
| 1808 | liac_1_1 | F |
| 1809 | liac_1_1 | R |
| 1810 | cim_1_1 | F |
| 1811 | cim_1_1 | R |
| 1812 | aldA_1_1 | F |
| 1813 | aldA_1_1 | R |
| 1814 | aldA_2_1 | F |
| 1815 | aldA_2_1 | R |
| 1816 | hemly_1_1 | F |
| 1817 | hemly_1_1 | R |
| 1818 | pSL017_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1819 | pSL017_1_1 | R |
| 1820 | pSL020_1_1 | F |
| 1821 | pSL020_1_1 | R |
| 1822 | rcaA_1_1 | F |
| 1823 | rcaA_1_1 | R |
| 1824 | rmlC_1_1 | F |
| 1825 | rmlC_1_1 | R |
| 1826 | rmlD_1_1 | F |
| 1827 | rmlD_1_1 | R |
| 1828 | waaG_1_1 | F |
| 1829 | waaG_1_1 | R |
| 1830 | wbbD_1_1 | F |
| 1831 | wbbD_1_1 | R |
| 1832 | wbbM_1_1 | F |
| 1833 | wbbM_1_1 | R |
| 1834 | wbbN_1_1 | F |
| 1835 | wbbN_1_1 | R |
| 1836 | wbdA_1_1 | F |
| 1837 | wbdA_1_1 | R |
| 1838 | wbdC_1_1 | F |
| 1839 | wbdC_1_1 | R |
| 1840 | wztKpn_1_1 | F |
| 1841 | wztKpn_1_1 | R |
| 1842 | yibD_1_1 | F |
| 1843 | yibD_1_1 | R |
| 1844 | cymA_1_1 | F |
| 1845 | cymA_1_1 | R |
| 1846 | cymD_1_1 | F |
| 1847 | cymD_1_1 | R |
| 1848 | cymE_1_1 | F |
| 1849 | cymE_1_1 | R |
| 1850 | cymH_1_1 | F |
| 1851 | cymH_1_1 | R |
| 1852 | cymI_1_1 | F |
| 1853 | cymI_1_1 | R |
| 1854 | cymJ_1_1 | F |
| 1855 | cymJ_1_1 | R |
| 1856 | ddrA_1_1 | F |
| 1857 | ddrA_1_1 | R |
| 1858 | fdt-1_1_1 | F |
| 1859 | fdt-1_1_1 | R |
| 1860 | fdt-2_1_1 | F |
| 1861 | fdt-2_1_1 | R |
| 1862 | fdt-3_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1863 | fdt-3_1_1 | R |
| 1864 | gatY_1_1 | F |
| 1865 | gatY_1_1 | R |
| 1866 | hydH_1_1 | F |
| 1867 | hydH_1_1 | R |
| 1868 | masA_1_1 | F |
| 1869 | masA_1_1 | R |
| 1870 | nasA_1_1 | F |
| 1871 | nasA_1_1 | R |
| 1872 | nasE_1_1 | F |
| 1873 | nasE_1_1 | R |
| 1874 | nasF_1_1 | F |
| 1875 | nasF_1_1 | R |
| 1876 | pehX_1_1 | F |
| 1877 | pehX_1_1 | R |
| 1878 | pelX_1_1 | F |
| 1879 | pelX_1_1 | R |
| 1880 | tagH_1_1 | F |
| 1881 | tagH_1_1 | R |
| 1882 | tagK_1_1 | F |
| 1883 | tagK_1_1 | R |
| 1884 | tagT_1_1 | F |
| 1885 | tagT_1_1 | R |
| 1886 | glpR_1_1 | F |
| 1887 | glpR_1_1 | R |
| 1888 | lasRb_1_1 | F |
| 1889 | lasRb_1_1 | R |
| 1890 | OrfX_1_1 | F |
| 1891 | OrfX_1_1 | R |
| 1892 | pa0260_1_1 | F |
| 1893 | pa0260_1_1 | R |
| 1894 | pa0572_1_1 | F |
| 1895 | pa0572_1_1 | R |
| 1896 | pa0625_1_1 | F |
| 1897 | pa0625_1_1 | R |
| 1898 | pa0636_1_1 | F |
| 1899 | pa0636_1_1 | R |
| 1900 | pa1046_1_1 | F |
| 1901 | pa1046_1_1 | R |
| 1902 | pa1069_1_1 | F |
| 1903 | pa1069_1_1 | R |
| 1904 | pa1846_1_1 | F |
| 1905 | pa1846_1_1 | R |
| 1906 | pa3866_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1907 | pa3866_1_1 | R |
| 1908 | pa4082_1_1 | F |
| 1909 | pa4082_1_1 | R |
| 1910 | pilAp_1_1 | F |
| 1911 | pilAp_1_1 | R |
| 1912 | PilAp2_1_1 | F |
| 1913 | PilAp2_1_1 | R |
| 1914 | pilC_1_1 | F |
| 1915 | pilC_1_1 | R |
| 1916 | PstP_1_1 | F |
| 1917 | PstP_1_1 | R |
| 1918 | purK_1_1 | F |
| 1919 | purK_1_1 | R |
| 1920 | uvrDII_1_1 | F |
| 1921 | uvrDII_1_1 | R |
| 1922 | vsmI_1_1 | F |
| 1923 | vsmI_1_1 | R |
| 1924 | vsmR_1_2 | F |
| 1925 | vsmR_1_2 | R |
| 1926 | xcpX_1_1 | F |
| 1927 | xcpX_1_1 | R |
| 1928 | aprA_1_1 | F |
| 1929 | aprA_1_1 | R |
| 1930 | aprE_1_1 | F |
| 1931 | aprE_1_1 | R |
| 1932 | ctx_1_2 | F |
| 1933 | ctx_1_2 | R |
| 1934 | algB_1_1 | F |
| 1935 | algB_1_1 | R |
| 1936 | algN_1_1 | F |
| 1937 | algN_1_1 | R |
| 1938 | algR_1_1 | F |
| 1939 | algR_1_1 | R |
| 1940 | ExoS_1_1 | F |
| 1941 | ExoS_1_1 | R |
| 1942 | fpvA_1_1 | F |
| 1943 | fpvA_1_1 | R |
| 1944 | lasRa_1_1 | F |
| 1945 | lasRa_1_1 | R |
| 1946 | lipA_1_1 | F |
| 1947 | lipA_1_1 | R |
| 1948 | lipH_1_1 | F |
| 1949 | lipH_1_1 | R |
| 1950 | Orf159_1_2 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 1951 | Orf159_1_2 | R |
| 1952 | Orf252_1_1 | F |
| 1953 | Orf252_1_1 | R |
| 1954 | pchG_1_1 | F |
| 1955 | pchG_1_1 | R |
| 1956 | PhzA_1_1 | F |
| 1957 | PhzA_1_1 | R |
| 1958 | PhzB_1_1 | F |
| 1959 | PhzB_1_1 | R |
| 1960 | PLC_1_1 | F |
| 1961 | PLC_1_1 | R |
| 1962 | plcN_1_1 | F |
| 1963 | plcN_1_1 | R |
| 1964 | plcR_1_1 | F |
| 1965 | plcR_1_1 | R |
| 1966 | pvdD_1_1 | F |
| 1967 | pvdD_1_1 | R |
| 1968 | pvdF_1_2 | F |
| 1969 | pvdF_1_2 | R |
| 1970 | pyocinS1_1_1 | F |
| 1971 | pyocinS1_1_1 | R |
| 1972 | pyocinS1im_1_1 | F |
| 1973 | pyocinS1im_1_1 | R |
| 1974 | pyocinS2_1_1 | F |
| 1975 | pyocinS2_1_1 | R |
| 1976 | pys2_1_1 | F |
| 1977 | pys2_1_1 | R |
| 1978 | pys2_2_1 | F |
| 1979 | pys2_2_1 | R |
| 1980 | rbf303_1_1 | F |
| 1981 | rbf303_1_1 | R |
| 1982 | rhIA_1_1 | F |
| 1983 | rhIA_1_1 | R |
| 1984 | rhIB_1_1 | F |
| 1985 | rhIB_1_1 | R |
| 1986 | rhIR_1_1 | F |
| 1987 | rhIR_1_1 | R |
| 1988 | TnAP41_1_2 | F |
| 1989 | TnAP41_1_2 | R |
| 1990 | toxA_1_1 | F |
| 1991 | toxA_1_1 | R |
| 1992 | cap1EStrpneu_1_1 | F |
| 1993 | cap1EStrpneu_1_1 | R |
| 1994 | cap1FStrpneu_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|---------------------|------------------|
| 1995 | cap1FStrpneu_1_1 | R |
| 1996 | cap1GStrpneu_1_1 | F |
| 1997 | cap1GStrpneu_1_1 | R |
| 1998 | cap3AStrpneu_1_1 | F |
| 1999 | cap3AStrpneu_1_1 | R |
| 2000 | cap3BStrpneu_1_1 | F |
| 2001 | cap3BStrpneu_1_1 | R |
| 2002 | celAStrpneu_1_1 | F |
| 2003 | celAStrpneu_1_1 | R |
| 2004 | celBStrpneu_1_1 | F |
| 2005 | celBStrpneu_1_1 | R |
| 2006 | cglAStrpneu_1_1 | F |
| 2007 | cglAStrpneu_1_1 | R |
| 2008 | cglBStrpneu_1_1 | F |
| 2009 | cglBStrpneu_1_1 | R |
| 2010 | cglCStrpneu_1_1 | F |
| 2011 | cglCStrpneu_1_1 | R |
| 2012 | cglDStrpneu_1_1 | F |
| 2013 | cglDStrpneu_1_1 | R |
| 2014 | cinA_1_1 | F |
| 2015 | cinA_1_1 | R |
| 2016 | cps14EStrpneum_1_1 | F |
| 2017 | cps14EStrpneum_1_1 | R |
| 2018 | cps14FStrpneum_1_1 | F |
| 2019 | cps14FStrpneum_1_1 | R |
| 2020 | cps14GStrpneum_1_1 | F |
| 2021 | cps14GStrpneum_1_1 | R |
| 2022 | cps14HStrpneum_1_1 | F |
| 2023 | cps14HStrpneum_1_1 | R |
| 2024 | cps19aHStrpneum_1_1 | F |
| 2025 | cps19aHStrpneum_1_1 | R |
| 2026 | cps19aIStrpneum_1_1 | F |
| 2027 | cps19aIStrpneum_1_1 | R |
| 2028 | cps19aKStrpneum_1_1 | F |
| 2029 | cps19aKStrpneum_1_1 | R |
| 2030 | cps19fGStrpneum_1_1 | F |
| 2031 | cps19fGStrpneum_1_1 | R |
| 2032 | cps23fGStrpneum_1_1 | F |
| 2033 | cps23fGStrpneum_1_1 | R |
| 2034 | dexB_1_1 | F |
| 2035 | dexB_1_1 | R |
| 2036 | dinF_1_1 | F |
| 2037 | dinF_1_1 | R |
| 2038 | 1760Strpneu_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|------------------------|-----------|
| 2039 | 1760Strpneu_1_1 | R |
| 2040 | acyPStrpneu_1_1 | F |
| 2041 | acyPStrpneu_1_1 | R |
| 2042 | endAStrpneu_1_1 | F |
| 2043 | endAStrpneu_1_1 | R |
| 2044 | exoAStrpneu_1_1 | F |
| 2045 | exoAStrpneu_1_1 | R |
| 2046 | exp72_1_1 | F |
| 2047 | exp72_1_1 | R |
| 2048 | fnlAStrpneu_1_1 | F |
| 2049 | fnlAStrpneu_1_1 | R |
| 2050 | fnlBStrpneu_1_1 | F |
| 2051 | fnlBStrpneu_1_1 | R |
| 2052 | fnlCStrpneu_1_1 | F |
| 2053 | fnlCStrpneu_1_1 | R |
| 2054 | gct18Strpneum_1_1 | F |
| 2055 | gct18Strpneum_1_1 | R |
| 2056 | hexB1_1_1 | F |
| 2057 | hexB1_1_1 | R |
| 2058 | hftsHstrpneu_1_1 | F |
| 2059 | hftsHstrpneu_1_1 | R |
| 2060 | immunofrag1Strpneu_1_1 | F |
| 2061 | immunofrag1Strpneu_1_1 | R |
| 2062 | immunofrag2Strpneu_2_1 | F |
| 2063 | immunofrag2Strpneu_2_1 | R |
| 2064 | immunofrag3Strpneu_2_1 | F |
| 2065 | immunofrag3Strpneu_2_1 | R |
| 2066 | kdtBStrpneu_1_1 | F |
| 2067 | kdtBStrpneu_1_1 | R |
| 2068 | lysAStrpneu_1_1 | F |
| 2069 | lysAStrpneu_1_1 | R |
| 2070 | pcpBStrpneu_1_1 | F |
| 2071 | pcpBStrpneu_1_1 | R |
| 2072 | pflCStrpneu_1_1 | F |
| 2073 | pflCStrpneu_1_1 | R |
| 2074 | plpA_1_1 | F |
| 2075 | plpA_1_1 | R |
| 2076 | prtA1Strpneu_1_1 | F |
| 2077 | prtA1Strpneu_1_1 | R |
| 2078 | pspC1Strpneu_1_1 | F |
| 2079 | pspC1Strpneu_1_1 | R |
| 2080 | pspC2_1_1 | F |
| 2081 | pspC2_1_1 | R |
| 2082 | purRStrpneu_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|----------------------|------------------|
| 2083 | purRStrpneu_1_1 | R |
| 2084 | pyrDAStrpneum_1_1 | F |
| 2085 | pyrDAStrpneum_1_1 | R |
| 2086 | SP0828Strpneu_1_1 | F |
| 2087 | SP0828Strpneu_1_1 | R |
| 2088 | SP0830Strpneu_1_1 | F |
| 2089 | SP0830Strpneu_1_1 | R |
| 2090 | SP0833Strpneu_1_1 | F |
| 2091 | SP0833Strpneu_1_1 | R |
| 2092 | SP0837_38Strpneu_1_1 | F |
| 2093 | SP0837_38Strpneu_1_1 | R |
| 2094 | SP0839Strpneu_1_1 | F |
| 2095 | SP0839Strpneu_1_1 | R |
| 2096 | ugdStrpneu_1_1 | F |
| 2097 | ugdStrpneu_1_1 | R |
| 2098 | uncC_1_1 | F |
| 2099 | uncC_1_1 | R |
| 2100 | vicXStrepneu_1_1 | F |
| 2101 | vicXStrepneu_1_1 | R |
| 2102 | wchA6bStrpneum_1_1 | F |
| 2103 | wchA6bStrpneum_1_1 | R |
| 2104 | wci4Strpneum_1_1 | F |
| 2105 | wci4Strpneum_1_1 | R |
| 2106 | wciK4Strpneum_1_1 | F |
| 2107 | wciK4Strpneum_1_1 | R |
| 2108 | wciL4Strpneum_1_1 | F |
| 2109 | wciL4Strpneum_1_1 | R |
| 2110 | wciN6bStrpneum_1_1 | F |
| 2111 | wciN6bStrpneum_1_1 | R |
| 2112 | wciO6bStrpneum_1_1 | F |
| 2113 | wciO6bStrpneum_1_1 | R |
| 2114 | wciP6bStrpneum_1_1 | F |
| 2115 | wciP6bStrpneum_1_1 | R |
| 2116 | wciY18Strpneum_1_1 | F |
| 2117 | wciY18Strpneum_1_1 | R |
| 2118 | wzdbStrpneum_1_1 | F |
| 2119 | wzdbStrpneum_1_1 | R |
| 2120 | wze6bStrpneum_1_1 | F |
| 2121 | wze6bStrpneum_1_1 | R |
| 2122 | wzy18Strpneum_1_1 | F |
| 2123 | wzy18Strpneum_1_1 | R |
| 2124 | wzy4Strpneum_1_1 | F |
| 2125 | wzy4Strpneum_1_1 | R |
| 2126 | wzy6bStrpneum_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2127 | wzy6bStrpneum_1_1 | R |
| 2128 | xpt_1_1 | F |
| 2129 | xpt_1_1 | R |
| 2130 | igaStrpneu_1_1 | F |
| 2131 | igaStrpneu_1_1 | R |
| 2132 | lytA_1_1 | F |
| 2133 | lytA_1_1 | R |
| 2134 | nanA_1_1 | F |
| 2135 | nanA_1_1 | R |
| 2136 | nanBStrpneu_1_1 | F |
| 2137 | nanBStrpneu_1_1 | R |
| 2138 | pcpCStrpneu_1_1 | F |
| 2139 | pcpCStrpneu_1_1 | R |
| 2140 | ply_1_1 | F |
| 2141 | ply_1_1 | R |
| 2142 | prtAStrpneu_1_1 | F |
| 2143 | prtAStrpneu_1_1 | R |
| 2144 | pspA_1_2 | F |
| 2145 | pspA_1_2 | R |
| 2146 | SP0834Strpneu_1_1 | F |
| 2147 | SP0834Strpneu_1_1 | R |
| 2148 | SP0834Strpneu_1_2 | F |
| 2149 | SP0834Strpneu_1_2 | R |
| 2150 | sphtraStrpneu_1_1 | F |
| 2151 | sphtraStrpneu_1_1 | R |
| 2152 | wciJStrpneu_1_1 | F |
| 2153 | wciJStrpneu_1_1 | R |
| 2154 | wziyStrpneu_1_1 | F |
| 2155 | wziyStrpneu_1_1 | R |
| 2156 | wzxStrpneu_1_1 | F |
| 2157 | wzxStrpneu_1_1 | R |
| 2158 | cpsA1Strgal_1_1 | F |
| 2159 | cpsA1Strgal_1_1 | R |
| 2160 | cpsB1Strgal_1_1 | F |
| 2161 | cpsB1Strgal_1_1 | R |
| 2162 | cpsC1Strgal_1_1 | F |
| 2163 | cpsC1Strgal_1_1 | R |
| 2164 | cpsD1Strgal_1_1 | F |
| 2165 | cpsD1Strgal_1_1 | R |
| 2166 | cpsE1Strgal_1_1 | F |
| 2167 | cpsE1Strgal_1_1 | R |
| 2168 | cpsG1Strgal_1_1 | F |
| 2169 | cpsG1Strgal_1_1 | R |
| 2170 | cpsIStragal_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2171 | cpsIStragal_1_1 | R |
| 2172 | cpsJStragal_1_1 | F |
| 2173 | cpsJStragal_1_1 | R |
| 2174 | cpsKStragal_1_1 | F |
| 2175 | cpsKStragal_1_1 | R |
| 2176 | cpsMStragal_1_1 | F |
| 2177 | cpsMStragal_1_1 | R |
| 2178 | cpsYStragal_1_1 | F |
| 2179 | cpsYStragal_1_1 | R |
| 2180 | cpsYStragal_2_1 | F |
| 2181 | cpsYStragal_2_1 | R |
| 2182 | cylBStraga_1_1 | F |
| 2183 | cylBStraga_1_1 | R |
| 2184 | cylEStraga_1_1 | F |
| 2185 | cylEStraga_1_1 | R |
| 2186 | cylFStraga_1_1 | F |
| 2187 | cylFStraga_1_1 | R |
| 2188 | cylHStraga_1_1 | F |
| 2189 | cylHStraga_1_1 | R |
| 2190 | cylIStraga_1_1 | F |
| 2191 | cylIStraga_1_1 | R |
| 2192 | cylJStraga_1_1 | F |
| 2193 | cylJStraga_1_1 | R |
| 2194 | cylKStraga_1_1 | F |
| 2195 | cylKStraga_1_1 | R |
| 2196 | 0487Straga_1_1 | F |
| 2197 | 0487Straga_1_1 | R |
| 2198 | 0488Straga_1_1 | F |
| 2199 | 0488Straga_1_1 | R |
| 2200 | 0493Straga_1_1 | F |
| 2201 | 0493Straga_1_1 | R |
| 2202 | 0495Straga_1_1 | F |
| 2203 | 0495Straga_1_1 | R |
| 2204 | 0498Straga_1_1 | F |
| 2205 | 0498Straga_1_1 | R |
| 2206 | 0500Straga_1_1 | F |
| 2207 | 0500Straga_1_1 | R |
| 2208 | 0502Straga_1_1 | F |
| 2209 | 0502Straga_1_1 | R |
| 2210 | 0504Straga_1_1 | F |
| 2211 | 0504Straga_1_1 | R |
| 2212 | foldStraga_1_1 | F |
| 2213 | foldStraga_1_1 | R |
| 2214 | neuA1Strgal_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------------|------------------|
| 2215 | neuA1Strgal_1_1 | R |
| 2216 | neuB1Strgal_1_1 | F |
| 2217 | neuB1Strgal_1_1 | R |
| 2218 | neuC1Strgal_1_1 | F |
| 2219 | neuC1Strgal_1_1 | R |
| 2220 | neuD1Strgal_1_1 | F |
| 2221 | neuD1Strgal_1_1 | R |
| 2222 | recNStraga_1_1 | F |
| 2223 | recNStraga_1_1 | R |
| 2224 | ileSStraga_1_1 | F |
| 2225 | ileSStraga_1_1 | R |
| 2226 | CAMPfactor_1_1 | F |
| 2227 | CAMPfactor_1_1 | R |
| 2228 | CAMPfactor_2_1 | F |
| 2229 | CAMPfactor_2_1 | R |
| 2230 | 0499Straga_1_1 | F |
| 2231 | 0499Straga_1_1 | R |
| 2232 | hylStragal_1_1 | F |
| 2233 | hylStragal_1_1 | R |
| 2234 | lipStragal_1_1 | F |
| 2235 | lipStragal_1_1 | R |
| 2236 | cyclStrpyog_1_1 | F |
| 2237 | cyclStrpyog_1_1 | R |
| 2238 | fah_rph_hlo_Strpyog_1_1 | F |
| 2239 | fah_rph_hlo_Strpyog_1_1 | R |
| 2240 | int_1_1 | F |
| 2241 | int_1_1 | R |
| 2242 | int315.5_1_1 | F |
| 2243 | int315.5_1_1 | R |
| 2244 | murEStrpyog_1_1 | F |
| 2245 | murEStrpyog_1_1 | R |
| 2246 | oppA_1_1 | F |
| 2247 | oppA_1_1 | R |
| 2248 | oppCStrpyog_1_1 | F |
| 2249 | oppCStrpyog_1_1 | R |
| 2250 | oppD_1_1 | F |
| 2251 | oppD_1_1 | R |
| 2252 | SPy0382Strpyog_1_1 | F |
| 2253 | SPy0382Strpyog_1_1 | R |
| 2254 | SPy0390Strpyog_1_1 | F |
| 2255 | SPy0390Strpyog_1_1 | R |
| 2256 | SpyM3_1351_1_1 | F |
| 2257 | SpyM3_1351_1_1 | R |
| 2258 | vicXStrpyog_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2259 | vicXStrpyog_1_1 | R |
| 2260 | DNaseIStrpyog_1_1 | F |
| 2261 | DNaseIStrpyog_1_1 | R |
| 2262 | fba2Strpyog_1_1 | F |
| 2263 | fba2Strpyog_1_1 | R |
| 2264 | fhuAStrpyog_1_1 | F |
| 2265 | fhuAStrpyog_1_1 | R |
| 2266 | fhuB1Strpyog_1_1 | F |
| 2267 | fhuB1Strpyog_1_1 | R |
| 2268 | fhuDStrpyog_1_1 | F |
| 2269 | fhuDStrpyog_1_1 | R |
| 2270 | fhuGStrpyog_1_1 | F |
| 2271 | fhuGStrpyog_1_1 | R |
| 2272 | hylA_1_1 | F |
| 2273 | hylA_1_1 | R |
| 2274 | hylP_1_1 | F |
| 2275 | hylP_1_1 | R |
| 2276 | hylp2_1_1 | F |
| 2277 | hylp2_1_1 | R |
| 2278 | oppB_1_1 | F |
| 2279 | oppB_1_1 | R |
| 2280 | ropB_1_1 | F |
| 2281 | ropB_1_1 | R |
| 2282 | scpAStrpyog_1_1 | F |
| 2283 | scpAStrpyog_1_1 | R |
| 2284 | sloStrpyog_1_1 | F |
| 2285 | sloStrpyog_1_1 | R |
| 2286 | smez-4Strpyog_1_1 | F |
| 2287 | smez-4Strpyog_1_1 | R |
| 2288 | sof_1_1 | F |
| 2289 | sof_1_1 | R |
| 2290 | sof_2_1 | F |
| 2291 | sof_2_1 | R |
| 2292 | speA_1_1 | F |
| 2293 | speA_1_1 | R |
| 2294 | speB2Strpyog_1_1 | F |
| 2295 | speB2Strpyog_1_1 | R |
| 2296 | speCStrpyog_1_1 | F |
| 2297 | speCStrpyog_1_1 | R |
| 2298 | speJStrpyog_1_1 | F |
| 2299 | speJStrpyog_1_1 | R |
| 2300 | srtBStrpyog_1_1 | F |
| 2301 | srtBStrpyog_1_1 | R |
| 2302 | srtCStrpyog_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|---------------------|------------------|
| 2303 | srtCStrpyog_1_1 | R |
| 2304 | srtEStrpyog_1_1 | F |
| 2305 | srtEStrpyog_1_1 | R |
| 2306 | srtFStrpyog_1_1 | F |
| 2307 | srtFStrpyog_1_1 | R |
| 2308 | srtGStrpyog_1_1 | F |
| 2309 | srtGStrpyog_1_1 | R |
| 2310 | srtIStrpyog_1_1 | F |
| 2311 | srtIStrpyog_1_1 | R |
| 2312 | srtKStrpyog_1_1 | F |
| 2313 | srtKStrpyog_1_1 | R |
| 2314 | srtRStrpyog_1_1 | F |
| 2315 | srtRStrpyog_1_1 | R |
| 2316 | srtTStrpyog_1_1 | F |
| 2317 | srtTStrpyog_1_1 | R |
| 2318 | vicKStrpyog_1_1 | F |
| 2319 | vicKStrpyog_1_1 | R |
| 2320 | 573Stprmut_1_1 | F |
| 2321 | 573Stprmut_1_1 | R |
| 2322 | 580SStprmut_1_1 | F |
| 2323 | 580SStprmut_1_1 | R |
| 2324 | 581_582SStprmut_1_1 | F |
| 2325 | 581_582SStprmut_1_1 | R |
| 2326 | 584SStprmut_1_1 | F |
| 2327 | 584SStprmut_1_1 | R |
| 2328 | dltAStrmut_1_1 | F |
| 2329 | dltAStrmut_1_1 | R |
| 2330 | dltBStrmut_1_1 | F |
| 2331 | dltBStrmut_1_1 | R |
| 2332 | dltCpx1Strmut_1_1 | F |
| 2333 | dltCpx1Strmut_1_1 | R |
| 2334 | dltDStrmut_1_1 | F |
| 2335 | dltDStrmut_1_1 | R |
| 2336 | lichStrbov_1_1 | F |
| 2337 | lichStrbov_1_1 | R |
| 2338 | lytRStprmut_1_1 | F |
| 2339 | lytRStprmut_1_1 | R |
| 2340 | lytSStprmut_1_1 | F |
| 2341 | lytSStprmut_1_1 | R |
| 2342 | pepQStrrmut_1_1 | F |
| 2343 | pepQStrrmut_1_1 | R |
| 2344 | pflCStrmut_1_1 | F |
| 2345 | pflCStrmut_1_1 | R |
| 2346 | recNStprmut_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2347 | recNStprmut_1_1 | R |
| 2348 | ytqBStrmut_1_1 | F |
| 2349 | ytqBStrmut_1_1 | R |
| 2350 | hlyXStrmut_1_1 | F |
| 2351 | hlyXStrmut_1_1 | R |
| 2352 | igaStrmitis_1_1 | F |
| 2353 | igaStrmitis_1_1 | R |
| 2354 | igaStrsanguis_1_1 | F |
| 2355 | igaStrsanguis_1_1 | R |
| 2356 | perMStrmut_1_1 | F |
| 2357 | perMStrmut_1_1 | R |
| 2358 | atfA_1_1 | F |
| 2359 | atfA_1_1 | R |
| 2360 | atfB_1_1 | F |
| 2361 | atfB_1_1 | R |
| 2362 | atfC_1_1 | F |
| 2363 | atfC_1_1 | R |
| 2364 | ccmPrmi1_1_1 | F |
| 2365 | ccmPrmi1_1_1 | R |
| 2366 | cyaPrmi_1_1 | F |
| 2367 | cyaPrmi_1_1 | R |
| 2368 | aad_1_1 | F |
| 2369 | aad_1_1 | R |
| 2370 | flfB_1_1 | F |
| 2371 | flfB_1_1 | R |
| 2372 | flfD_1_1 | F |
| 2373 | flfD_1_1 | R |
| 2374 | flfN_1_1 | F |
| 2375 | flfN_1_1 | R |
| 2376 | flhD_1_1 | F |
| 2377 | flhD_1_1 | R |
| 2378 | floA_1_1 | F |
| 2379 | floA_1_1 | R |
| 2380 | ftsK_1_1 | F |
| 2381 | ftsK_1_1 | R |
| 2382 | gstB_1_1 | F |
| 2383 | gstB_1_1 | R |
| 2384 | hemCPrmi_1_1 | F |
| 2385 | hemCPrmi_1_1 | R |
| 2386 | hemDPrmi_1_1 | F |
| 2387 | hemDPrmi_1_1 | R |
| 2388 | hev_1_1 | F |
| 2389 | hev_1_1 | R |
| 2390 | katA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|------------|-----------|
| 2391 | katA_1_1 | R |
| 2392 | lpp1_1_1 | F |
| 2393 | lpp1_1_1 | R |
| 2394 | menE_1_1 | F |
| 2395 | menE_1_1 | R |
| 2396 | mfd_1_1 | F |
| 2397 | mfd_1_1 | R |
| 2398 | nrpA_1_1 | F |
| 2399 | nrpA_1_1 | R |
| 2400 | nrpB_1_1 | F |
| 2401 | nrpB_1_1 | R |
| 2402 | nrpG_1_1 | F |
| 2403 | nrpG_1_1 | R |
| 2404 | nrpS_1_1 | F |
| 2405 | nrpS_1_1 | R |
| 2406 | nrpT_1_1 | F |
| 2407 | nrpT_1_1 | R |
| 2408 | nrpU_1_1 | F |
| 2409 | nrpU_1_1 | R |
| 2410 | pat_1_1 | F |
| 2411 | pat_1_1 | R |
| 2412 | pmfA_1_1 | F |
| 2413 | pmfA_1_1 | R |
| 2414 | pmfC_1_1 | F |
| 2415 | pmfC_1_1 | R |
| 2416 | pmfE_1_1 | F |
| 2417 | pmfE_1_1 | R |
| 2418 | ppaA_1_1 | F |
| 2419 | ppaA_1_1 | R |
| 2420 | rsbA_1_1 | F |
| 2421 | rsbA_1_1 | R |
| 2422 | rsbC_1_1 | F |
| 2423 | rsbC_1_1 | R |
| 2424 | speB_1_1 | F |
| 2425 | speB_1_1 | R |
| 2426 | stmA_1_1 | F |
| 2427 | stmA_1_1 | R |
| 2428 | stmB_1_1 | F |
| 2429 | stmB_1_1 | R |
| 2430 | terA_1_1 | F |
| 2431 | terA_1_1 | R |
| 2432 | terD_1_1 | F |
| 2433 | terD_1_1 | R |
| 2434 | umoA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2435 | umoA_1_1 | R |
| 2436 | umoB_1_1 | F |
| 2437 | umoB_1_1 | R |
| 2438 | umoC_1_1 | F |
| 2439 | umoC_1_1 | R |
| 2440 | ureR_1_1 | F |
| 2441 | ureR_1_1 | R |
| 2442 | xerC_1_1 | F |
| 2443 | xerC_1_1 | R |
| 2444 | ygbA_1_1 | F |
| 2445 | ygbA_1_1 | R |
| 2446 | flaA_1_1 | F |
| 2447 | flaA_1_1 | R |
| 2448 | flaD_1_1 | F |
| 2449 | flaD_1_1 | R |
| 2450 | fliA_1_1 | F |
| 2451 | fliA_1_1 | R |
| 2452 | hpmA_1_1 | F |
| 2453 | hpmA_1_1 | R |
| 2454 | hpmB_1_1 | F |
| 2455 | hpmB_1_1 | R |
| 2456 | lpsPrmi_1_1 | F |
| 2457 | lpsPrmi_1_1 | R |
| 2458 | mrpA_1_1 | F |
| 2459 | mrpA_1_1 | R |
| 2460 | mrpB_1_1 | F |
| 2461 | mrpB_1_1 | R |
| 2462 | mrpC_1_1 | F |
| 2463 | mrpC_1_1 | R |
| 2464 | mrpD_1_1 | F |
| 2465 | mrpD_1_1 | R |
| 2466 | mrpE_1_1 | F |
| 2467 | mrpE_1_1 | R |
| 2468 | mrpF_1_1 | F |
| 2469 | mrpF_1_1 | R |
| 2470 | mrpG_1_1 | F |
| 2471 | mrpG_1_1 | R |
| 2472 | mrpH_1_1 | F |
| 2473 | mrpH_1_1 | R |
| 2474 | mrpI_1_1 | F |
| 2475 | mrpI_1_1 | R |
| 2476 | mrpJ_1_1 | F |
| 2477 | mrpJ_1_1 | R |
| 2478 | patA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2479 | patA_1_1 | R |
| 2480 | putA_1_1 | F |
| 2481 | putA_1_1 | R |
| 2482 | uca_1_1 | F |
| 2483 | uca_1_1 | R |
| 2484 | ureDPrmi_1_1 | F |
| 2485 | ureDPrmi_1_1 | R |
| 2486 | ureEPrmi_1_1 | F |
| 2487 | ureEPrmi_1_1 | R |
| 2488 | ureFPrmi_1_1 | F |
| 2489 | ureFPrmi_1_1 | R |
| 2490 | zapA_1_1 | F |
| 2491 | zapA_1_1 | R |
| 2492 | zapB_1_1 | F |
| 2493 | zapB_1_1 | R |
| 2494 | zapD_1_1 | F |
| 2495 | zapD_1_1 | R |
| 2496 | zapE_1_1 | F |
| 2497 | zapE_1_1 | R |
| 2498 | envZPrvu_1_1 | F |
| 2499 | envZPrvu_1_1 | R |
| 2500 | frdC_1_1 | F |
| 2501 | frdC_1_1 | R |
| 2502 | frdD_1_1 | F |
| 2503 | frdD_1_1 | R |
| 2504 | infBPrvu_1_1 | F |
| 2505 | infBPrvu_1_1 | R |
| 2506 | lad_1_1 | F |
| 2507 | lad_1_1 | R |
| 2508 | tna2_1_1 | F |
| 2509 | tna2_1_1 | R |
| 2510 | end_1_1 | F |
| 2511 | end_1_1 | R |
| 2512 | pqrA_1_1 | F |
| 2513 | pqrA_1_1 | R |
| 2514 | urg_1_1 | F |
| 2515 | urg_1_1 | R |
| 2516 | blaIMP-7_1_1 | F |
| 2517 | blaIMP-7_1_1 | R |
| 2518 | mecISepid_1_1 | F |
| 2519 | mecISepid_1_1 | R |
| 2520 | blaOXA-10_1_2 | F |
| 2521 | blaOXA-10_1_2 | R |
| 2522 | blaB_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|--------------------|-----------|
| 2523 | blaB_1_1 | R |
| 2524 | ampC_1_1 | F |
| 2525 | ampC_1_1 | R |
| 2526 | I-blaR_1_1 | F |
| 2527 | I-blaR_1_1 | R |
| 2528 | blaOXA-32_1_1 | F |
| 2529 | blaOXA-32_1_1 | R |
| 2530 | bla-CTX-M-22_1_1 | F |
| 2531 | bla-CTX-M-22_1_1 | R |
| 2532 | pbp2aStrpneu_1_1 | F |
| 2533 | pbp2aStrpneu_1_1 | R |
| 2534 | blaSHV-1_1_1 | F |
| 2535 | blaSHV-1_1_1 | R |
| 2536 | blaOXA-2_1_1 | F |
| 2537 | blaOXA-2_1_1 | R |
| 2538 | blaRShaemolyt_1_1 | F |
| 2539 | blaRShaemolyt_1_1 | R |
| 2540 | blaIMP-7_1_2 | F |
| 2541 | blaIMP-7_1_2 | R |
| 2542 | I-mecR_1_1 | F |
| 2543 | I-mecR_1_1 | R |
| 2544 | blaOXY_1_1 | F |
| 2545 | blaOXY_1_1 | R |
| 2546 | dacCStrpyog_1_1 | F |
| 2547 | dacCStrpyog_1_1 | R |
| 2548 | femA_1_1 | F |
| 2549 | femA_1_1 | R |
| 2550 | mecA_1_1 | F |
| 2551 | mecA_1_1 | R |
| 2552 | blaIShaemolyt_1_1 | F |
| 2553 | blaIShaemolyt_1_1 | R |
| 2554 | blavim_1_1 | F |
| 2555 | blavim_1_1 | R |
| 2556 | pbp2b_1_1 | F |
| 2557 | pbp2b_1_1 | R |
| 2558 | pbp2primeSepid_1_1 | F |
| 2559 | pbp2primeSepid_1_1 | R |
| 2560 | pbp2x_1_1 | F |
| 2561 | pbp2x_1_1 | R |
| 2562 | pbp3Saureuc_1_1 | F |
| 2563 | pbp3Saureuc_1_1 | R |
| 2564 | pbp4_1_1 | F |
| 2565 | pbp4_1_1 | R |
| 2566 | pbp5Efaecium_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|--------------------|------------------|
| 2567 | pbp5Efaecium_1_1 | R |
| 2568 | pbpC_1_1 | F |
| 2569 | pbpC_1_1 | R |
| 2570 | I-mecI_1_1 | F |
| 2571 | I-mecI_1_1 | R |
| 2572 | pbp1a_1_1 | F |
| 2573 | pbp1a_1_1 | R |
| 2574 | I-blaI_1_1 | F |
| 2575 | I-blaI_1_1 | R |
| 2576 | blaTEM-106_1_1 | F |
| 2577 | blaTEM-106_1_1 | R |
| 2578 | blaOXY-KLOX_1_1 | F |
| 2579 | blaOXY-KLOX_1_1 | R |
| 2580 | ftsWEF_1_1 | F |
| 2581 | ftsWEF_1_1 | R |
| 2582 | fmhB_1_1 | F |
| 2583 | fmhB_1_1 | R |
| 2584 | cumA_1_1 | F |
| 2585 | cumA_1_1 | R |
| 2586 | femBShaemolyt_1_1 | F |
| 2587 | femBShaemolyt_1_1 | R |
| 2588 | blaPER-1_1_1 | F |
| 2589 | blaPER-1_1_1 | R |
| 2590 | bla_FOX-3_1_1 | F |
| 2591 | bla_FOX-3_1_1 | R |
| 2592 | blaA_1_1 | F |
| 2593 | blaA_1_1 | R |
| 2594 | psrb_1_1 | F |
| 2595 | psrb_1_1 | R |
| 2596 | fmhA_1_1 | F |
| 2597 | fmhA_1_1 | R |
| 2598 | mecR1Sepid_1_1 | F |
| 2599 | mecR1Sepid_1_1 | R |
| 2600 | blaZ_1_1 | F |
| 2601 | blaZ_1_1 | R |
| 2602 | blaOXA-1_1_1 | F |
| 2603 | blaOXA-1_1_1 | R |
| 2604 | fox-6_1_1 | F |
| 2605 | fox-6_1_1 | R |
| 2606 | blaPrmi_1_1 | F |
| 2607 | blaPrmi_1_1 | R |
| 2608 | aacA_aphDStwar_1_1 | F |
| 2609 | aacA_aphDStwar_1_1 | R |
| 2610 | aacC1_1_2 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2611 | aacC1_1_2 | R |
| 2612 | aacC2_1_1 | F |
| 2613 | aacC2_1_1 | R |
| 2614 | strB_1_1 | F |
| 2615 | strB_1_1 | R |
| 2616 | aadA_1_1 | F |
| 2617 | aadA_1_1 | R |
| 2618 | aadB_1_2 | F |
| 2619 | aadB_1_2 | R |
| 2620 | aadD_1_1 | F |
| 2621 | aadD_1_1 | R |
| 2622 | aacA4_1_2 | F |
| 2623 | aacA4_1_2 | R |
| 2624 | strA_1_1 | F |
| 2625 | strA_1_1 | R |
| 2626 | aph-A3_1_1 | F |
| 2627 | aph-A3_1_1 | R |
| 2628 | aacC1_1_1 | F |
| 2629 | aacC1_1_1 | R |
| 2630 | aacA4_1_1 | F |
| 2631 | aacA4_1_1 | R |
| 2632 | aacA-aphD_1_1 | F |
| 2633 | aacA-aphD_1_1 | R |
| 2634 | I-spc_1_1 | F |
| 2635 | I-spc_1_1 | R |
| 2636 | aphA3_1_1 | F |
| 2637 | aphA3_1_1 | R |
| 2638 | ermC_1_1 | F |
| 2639 | ermC_1_1 | R |
| 2640 | linB_1_1 | F |
| 2641 | linB_1_1 | R |
| 2642 | satSA_1_1 | F |
| 2643 | satSA_1_1 | R |
| 2644 | mdrSA_1_1 | F |
| 2645 | mdrSA_1_1 | R |
| 2646 | I-linA_1_1 | F |
| 2647 | I-linA_1_1 | R |
| 2648 | ermB_1_2 | F |
| 2649 | ermB_1_2 | R |
| 2650 | ermA_1_1 | F |
| 2651 | ermA_1_1 | R |
| 2652 | satA_1_1 | F |
| 2653 | satA_1_1 | R |
| 2654 | msrA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2655 | msrA_1_1 | R |
| 2656 | mphBM_1_1 | F |
| 2657 | mphBM_1_1 | R |
| 2658 | mefA_1_1 | F |
| 2659 | mefA_1_1 | R |
| 2660 | mrx_1_1 | F |
| 2661 | mrx_1_1 | R |
| 2662 | dfrStrpneu_1_1 | F |
| 2663 | dfrStrpneu_1_1 | R |
| 2664 | dfrA_1_1 | F |
| 2665 | dfrA_1_1 | R |
| 2666 | cmlA5_1_1 | F |
| 2667 | cmlA5_1_1 | R |
| 2668 | catEfaecium_1_1 | F |
| 2669 | catEfaecium_1_1 | R |
| 2670 | cat_1_1 | F |
| 2671 | cat_1_1 | R |
| 2672 | tetAJ_1_1 | F |
| 2673 | tetAJ_1_1 | R |
| 2674 | tetL_1_1 | F |
| 2675 | tetL_1_1 | R |
| 2676 | tetM_1_1 | F |
| 2677 | tetM_1_1 | R |
| 2678 | vanH(tn)_1_1 | F |
| 2679 | vanH(tn)_1_1 | R |
| 2680 | vanA_1_1 | F |
| 2681 | vanA_1_1 | R |
| 2682 | vanHB2_1_1 | F |
| 2683 | vanHB2_1_1 | R |
| 2684 | vanR_1_1 | F |
| 2685 | vanR_1_1 | R |
| 2686 | vanRB2_1_1 | F |
| 2687 | vanRB2_1_1 | R |
| 2688 | vanS(tn)_1_1 | F |
| 2689 | vanS(tn)_1_1 | R |
| 2690 | vanSB2_1_1 | F |
| 2691 | vanSB2_1_1 | R |
| 2692 | vanWB2_1_1 | F |
| 2693 | vanWB2_1_1 | R |
| 2694 | ddl_1_1 | F |
| 2695 | ddl_1_1 | R |
| 2696 | ble_1_1 | F |
| 2697 | ble_1_1 | R |
| 2698 | vanXB2_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|-----------|-----------------|-----------|
| 2699 | vanXB2_1_1 | R |
| 2700 | vanY(tn)_1_1 | F |
| 2701 | vanY(tn)_1_1 | R |
| 2702 | vanYB2_1_1 | F |
| 2703 | vanYB2_1_1 | R |
| 2704 | vanB_1_1 | F |
| 2705 | vanB_1_1 | R |
| 2706 | vanZ(tn)_1_1 | F |
| 2707 | vanZ(tn)_1_1 | R |
| 2708 | vanC-2_1_1 | F |
| 2709 | vanC-2_1_1 | R |
| 2710 | vanX(tn)_1_1 | F |
| 2711 | vanX(tn)_1_1 | R |
| 2712 | acrB_1_1 | F |
| 2713 | acrB_1_1 | R |
| 2714 | mexB_1_2 | F |
| 2715 | mexB_1_2 | R |
| 2716 | I-qacA_1_1 | F |
| 2717 | I-qacA_1_1 | R |
| 2718 | sulI_1_1 | F |
| 2719 | sulI_1_1 | R |
| 2720 | sul_1_1 | F |
| 2721 | sul_1_1 | R |
| 2722 | cadBStalugd_1_1 | F |
| 2723 | cadBStalugd_1_1 | R |
| 2724 | mexA_1_1 | F |
| 2725 | mexA_1_1 | R |
| 2726 | acrR_1_1 | F |
| 2727 | acrR_1_1 | R |
| 2728 | emeA_1_1 | F |
| 2729 | emeA_1_1 | R |
| 2730 | acrA_1_1 | F |
| 2731 | acrA_1_1 | R |
| 2732 | rtn_1_1 | F |
| 2733 | rtn_1_1 | R |
| 2734 | abcXStrpmut_1_1 | F |
| 2735 | abcXStrpmut_1_1 | R |
| 2736 | qacEdelta1_1_1 | F |
| 2737 | qacEdelta1_1_1 | R |
| 2738 | elkT-abcA_1_1 | F |
| 2739 | elkT-abcA_1_1 | R |
| 2740 | I-cadA_1_1 | F |
| 2741 | I-cadA_1_1 | R |
| 2742 | albA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2743 | albA_1_1 | R |
| 2744 | wzm_1_1 | F |
| 2745 | wzm_1_1 | R |
| 2746 | msrCb_1_1 | F |
| 2747 | msrCb_1_1 | R |
| 2748 | nov_1_1 | F |
| 2749 | nov_1_1 | R |
| 2750 | wzt_1_1 | F |
| 2751 | wzt_1_1 | R |
| 2752 | wbbl_1_1 | F |
| 2753 | wbbl_1_1 | R |
| 2754 | norA23_1_1 | F |
| 2755 | norA23_1_1 | R |
| 2756 | mexR_1_1 | F |
| 2757 | mexR_1_1 | R |
| 2758 | arr2_1_1 | F |
| 2759 | arr2_1_1 | R |
| 2760 | mreA_1_1 | F |
| 2761 | mreA_1_1 | R |
| 2762 | I-cadC_1_1 | F |
| 2763 | I-cadC_1_1 | R |
| 2764 | uvrA_1_1 | F |
| 2765 | uvrA_1_1 | R |
| 2766 | CRD2_1_1 | F |
| 2767 | CRD2_1_1 | R |
| 2768 | CDR1_1_1 | F |
| 2769 | CDR1_1_1 | R |
| 2770 | CDR1_2_1 | F |
| 2771 | CDR1_2_1 | R |
| 2772 | MET3_1_1 | F |
| 2773 | MET3_1_1 | R |
| 2774 | FET3_1_1 | F |
| 2775 | FET3_1_1 | R |
| 2776 | FTR2_1_1 | F |
| 2777 | FTR2_1_1 | R |
| 2778 | MDR1-7_1_1 | F |
| 2779 | MDR1-7_1_1 | R |
| 2780 | ERG11_1_1 | F |
| 2781 | ERG11_1_1 | R |
| 2782 | SEC20_1_1 | F |
| 2783 | SEC20_1_1 | R |
| 2784 | rbcL_1_1 | F |
| 2785 | rbcL_1_1 | R |
| 2786 | LDHA(hu)_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|------------------------|------------------|
| 2787 | LDHA(hu)_1_1 | R |
| 2788 | GAPD(hu)_1_1 | F |
| 2789 | GAPD(hu)_1_1 | R |
| 2790 | b-Act(hu)_1_1 | F |
| 2791 | b-Act(hu)_1_1 | R |
| 2792 | ARHGDIA(hu)_1_1 | F |
| 2793 | ARHGDIA(hu)_1_1 | R |
| 2794 | PGK1(hu)_1_1 | F |
| 2795 | PGK1(hu)_1_1 | R |
| 2796 | rbcL_1_2 | F |
| 2797 | rbcL_1_2 | R |
| 2798 | 16SPa_1_1 | F |
| 2799 | 16SPa_1_1 | R |
| 2800 | 23SEfaecium_2_1 | F |
| 2801 | 23SEfaecium_2_1 | R |
| 2802 | 16SStrepyog_1_1 | F |
| 2803 | 16SStrepyog_1_1 | R |
| 2804 | 16SStrepneu_1_1 | F |
| 2805 | 16SStrepneu_1_1 | R |
| 2806 | 16SStrepagalactiae_1_1 | F |
| 2807 | 16SStrepagalactiae_1_1 | R |
| 2808 | 16SEfaecium_1_1 | F |
| 2809 | 16SEfaecium_1_1 | R |
| 2810 | 16SEfaecium_2_1 | F |
| 2811 | 16SEfaecium_2_1 | R |
| 2812 | 16SRNAEf_2_1 | F |
| 2813 | 16SRNAEf_2_1 | R |
| 2814 | 16SKpn_1_1 | F |
| 2815 | 16SKpn_1_1 | R |
| 2816 | 16SSa_3_1 | F |
| 2817 | 16SSa_3_1 | R |
| 2818 | 16SRNAEf_1_1 | F |
| 2819 | 16SRNAEf_1_1 | R |
| 2820 | 16SShominis_1_1 | F |
| 2821 | 16SShominis_1_1 | R |
| 2822 | 16SShaemolyt_1_1 | F |
| 2823 | 16SShaemolyt_1_1 | R |
| 2824 | 23SEfaecium_1_1 | F |
| 2825 | 23SEfaecium_1_1 | R |
| 2826 | 16SrRNAPrmi_1_1 | F |
| 2827 | 16SrRNAPrmi_1_1 | R |
| 2828 | 16SrRNAPrvu1_1_1 | F |
| 2829 | 16SrRNAPrvu1_1_1 | R |
| 2830 | 16SSa_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|--------------------|------------------|
| 2831 | 16SSa_1_1 | R |
| 2832 | 16SKlox_1_1 | F |
| 2833 | 16SKlox_1_1 | R |
| 2834 | p53_1_1 | F |
| 2835 | p53_1_1 | R |
| 2836 | 0135mihck_1_1 | F |
| 2837 | 0135mihck_1_1 | R |
| 2838 | FAN_1_1 | F |
| 2839 | FAN_1_1 | R |
| 2840 | 0270cap_1_1 | F |
| 2841 | 0270cap_1_1 | R |
| 2909 | 16SStrepdysgal_1_1 | F |
| 2910 | 16SStrepdysgal_1_1 | R |
| 2911 | carO_1_1 | F |
| 2912 | carO_1_1 | R |
| 2913 | gacS_1_1 | F |
| 2914 | gacS_1_1 | R |
| 2915 | dhbA_1_1 | F |
| 2916 | dhbA_1_1 | R |
| 2917 | dhbB_1_1 | F |
| 2918 | dhbB_1_1 | R |
| 2919 | sid_1_1 | F |
| 2920 | sid_1_1 | R |
| 2921 | csuD_1_1 | F |
| 2922 | csuD_1_1 | R |
| 2923 | csuC_1_1 | F |
| 2924 | csuC_1_1 | R |
| 2925 | tnp-ACIBA_1_1 | F |
| 2926 | tnp-ACIBA_1_1 | R |
| 2927 | waaA-ACIBA_1_1 | F |
| 2928 | waaA-ACIBA_1_1 | R |
| 2929 | csuB_1_1 | F |
| 2930 | csuB_1_1 | R |
| 2931 | csuA_B_1_1 | F |
| 2932 | csuA_B_1_1 | R |
| 2933 | csuA_1_1 | F |
| 2934 | csuA_1_1 | R |
| 2935 | put1_1_1 | F |
| 2936 | put1_1_1 | R |
| 2937 | por_1_1 | F |
| 2938 | por_1_1 | R |
| 2939 | abc_1_1 | F |
| 2940 | abc_1_1 | R |
| 2941 | furACIBA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2942 | furACIBA_1_1 | R |
| 2943 | dec_1_1 | F |
| 2944 | dec_1_1 | R |
| 2945 | cysI_1_1 | F |
| 2946 | cysI_1_1 | R |
| 2947 | trpE_1_1 | F |
| 2948 | trpE_1_1 | R |
| 2949 | put3_1_1 | F |
| 2950 | put3_1_1 | R |
| 2951 | ompA-ACIBA_1_1 | F |
| 2952 | ompA-ACIBA_1_1 | R |
| 2953 | aacA4ENCL_1_1 | F |
| 2954 | aacA4ENCL_1_1 | R |
| 2955 | AdeR-ACIBA_1_1 | F |
| 2956 | AdeR-ACIBA_1_1 | R |
| 2957 | adeA-ACIBA_1_1 | F |
| 2958 | adeA-ACIBA_1_1 | R |
| 2959 | aac(6p)-lb7_1_1 | F |
| 2960 | aac(6p)-lb7_1_1 | R |
| 2961 | adeB-ACIBA_1_1 | F |
| 2962 | adeB-ACIBA_1_1 | R |
| 2963 | adeC-ACIBA_1_1 | F |
| 2964 | adeC-ACIBA_1_1 | R |
| 2965 | AdeS-ACIBA_1_1 | F |
| 2966 | AdeS-ACIBA_1_1 | R |
| 2967 | blaL2_1_1 | F |
| 2968 | blaL2_1_1 | R |
| 2969 | blaMIR-3_1_1 | F |
| 2970 | blaMIR-3_1_1 | R |
| 2971 | ampR_1_1 | F |
| 2972 | ampR_1_1 | R |
| 2973 | ampC-ENCL_1_1 | F |
| 2974 | ampC-ENCL_1_1 | R |
| 2975 | blaL1_1_1 | F |
| 2976 | blaL1_1_1 | R |
| 2977 | asr_1_1 | F |
| 2978 | asr_1_1 | R |
| 2979 | lacZ_1_1 | F |
| 2980 | lacZ_1_1 | R |
| 2981 | ehuS_1_1 | F |
| 2982 | ehuS_1_1 | R |
| 2983 | ehuV_1_1 | F |
| 2984 | ehuV_1_1 | R |
| 2985 | slyA_1_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 2986 | slyA_1_1 | R |
| 2987 | ORF165_1_1 | F |
| 2988 | ORF165_1_1 | R |
| 2989 | ehuU_1_1 | F |
| 2990 | ehuU_1_1 | R |
| 2991 | ehuT_1_1 | F |
| 2992 | ehuT_1_1 | R |
| 2993 | ORF295_1_1 | F |
| 2994 | ORF295_1_1 | R |
| 2995 | ehuA_1_1 | F |
| 2996 | ehuA_1_1 | R |
| 2997 | ORF400_1_1 | F |
| 2998 | ORF400_1_1 | R |
| 2999 | H+ATPase_1_1 | F |
| 3000 | H+ATPase_1_1 | R |
| 3001 | sulII_1_1 | F |
| 3002 | sulII_1_1 | R |
| 3003 | smeE_1_1 | F |
| 3004 | smeE_1_1 | R |
| 3005 | eE_1_1 | F |
| 3006 | eE_1_1 | R |
| 3007 | StmPr1_1_1 | F |
| 3008 | StmPr1_1_1 | R |
| 3009 | eD_2_1 | F |
| 3010 | eD_2_1 | R |
| 3011 | ppi_1_1 | F |
| 3012 | ppi_1_1 | R |
| 3013 | pmp-STEMA_1_1 | F |
| 3014 | pmp-STEMA_1_1 | R |
| 3015 | pam_1_1 | F |
| 3016 | pam_1_1 | R |
| 3017 | ORF4-STEMA_1_1 | F |
| 3018 | ORF4-STEMA_1_1 | R |
| 3019 | ORF2-STEMA_1_1 | F |
| 3020 | ORF2-STEMA_1_1 | R |
| 3021 | et_1_1 | F |
| 3022 | et_1_1 | R |
| 3023 | eF_1_1 | F |
| 3024 | eF_1_1 | R |
| 3025 | StmPr2_1_1 | F |
| 3026 | StmPr2_1_1 | R |
| 3027 | smeF4494_1_1 | F |
| 3028 | smeF4494_1_1 | R |
| 3029 | coa_3_1 | F |

| SEQ ID NO | Probe name | Direction |
|------------------|-------------------|------------------|
| 3030 | coa_3_1 | R |
| 3031 | coa_2_2 | F |
| 3032 | coa_2_2 | R |
| 3033 | fasCAXStrdysg_1_1 | F |
| 3034 | fasCAXStrdysg_1_1 | R |
| 3035 | sloStrep_1_1 | F |
| 3036 | sloStrep_1_1 | R |
| 3037 | ydhK_1_1 | F |
| 3038 | ydhK_1_1 | R |
| 3039 | tetA-ACIBA_1_1 | F |
| 3040 | tetA-ACIBA_1_1 | R |
| 3041 | tetR-ACIBA_1_1 | F |
| 3042 | tetR-ACIBA_1_1 | R |

Claims

1. An analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt).
2. The analytical device of claim 1, which is a DNA coated bead, a set of DNA coated beads, or a DNA microarray, preferably a DNA microarray.
3. The analytical device of claim 1 or 2 which is suitable for species specific identification of one microbial strain or a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi, and which furthermore allows differentiation of the target species from each other and from non-target-species contained in one sample comprising a plurality of microbial strains.
4. The analytical device of claim 3 which is suitable for species specific identification of microorganisms causing bacteremia, fungemia or sepsis in a clinical sample.
5. The analytical device of any one of claims 1 to 4, wherein the device is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococci*, *E. coli* and *Candida sp.*, preferably for species specific identification of *Staphylococci*.
6. The analytical device of any one of claims 1 to 5, which is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococcus aureus*, *Escherichia coli*, CoNS (including *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*), *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Pseudomonas aeruginosa*, *Streptococcus agalactiae*, *Streptococcus mutans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Proteus mirabilis*, *Proteus vulgaris*, *Candida albicans*, *Acinetobacter baumannii*.
7. The analytical device of claim 6, wherein the device is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes

selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

8. The analytical device of claim 6 or 7, wherein the device is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively.

9. The analytical device of claim 8, which is suitable for species specific detection or differentiation of

(i) *S. aureus* and comprises SEQ ID NO:71;

(ii) CoNS and comprises SEQ ID NO:2906;

(iii) *E. coli* and comprises SEQ ID NO:145; and/or

(iv) *Candida albicans* and comprises SEQ ID NO:249.

10. The analytical device of any one of claims 7 to 9, which is suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

5 11. The analytical device of any one of claims 1 to 10, which additionally comprises virulence and/or resistance gene probes.

12. The analytical device of any one of claims 1 to 11, wherein

(i) the length of the gene probes is from 100 to 1000 nt, preferably from 200 to 800 nt; and/or

10 (ii) specific gene probes are present for each specific microbial species or group of microorganisms to be identified or differentiated, which gene probes preferably are DNA sequences selected from the groups consisting of (a) species specific gene probes, (b) virulence gene probes and (c) resistance gene probes; and/or

15 (iii) the sample is selected from whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, wound fluid, swabs, positive blood cultures, preferably is positive blood cultures; and/or

(iv) the device further comprises DNA sequences selected from the group (d) consisting of control gene probes coding for negative controls and positive controls.

13. The analytical device of claim 3, which is suitable for diagnosis of

20 (i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus*, *E. coli*, CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*;
25 and/or

(iii) urinary tract infenctions, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

30 14. The analytical device of any one of claims 1 to 13, wherein the set of gene probes preferably comprises gene probes selected from

(a) species specific gene probes for

- (i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *fnbA*, *femA*, *fmhB*,
5 *fmhA*;
- (ii) *Escherichia coli* including gene probes derived *b1169*, *fliCb*, *nfrB*, *yachH*, *ycdS*, *yciQ*, *shuA*;
- (iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*,
10 *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;
- (v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*,
15 *agrC2Stalugd*, *slamStalugd*;
- (vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;
- (vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;
- 20 (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;
- (ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*, *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*,
25 *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;
- (x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*, *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebaA*, *ebaB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCb2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*,
30 *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;

- (xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*, *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;
- 5 (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yojH*, *liac*;
- (xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;
- 10 (xvi) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;
- (xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*,
 15 *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*, *cps23fGStrpneu*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneu*,
 20 *hexB1*, *hftsHStrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*, *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneu*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneu*,
 25 *wci4Strpneu*, *wciK4Strpneu*, *wciL4Strpneu*, *wciN6bStrpneu*, *wciO6bStrpneu*, *wciP6bStrpneu*, *wciY18Strpneu*, *wzdbStrpneu*, *wze6bStrpneu*, *wzy18Strpneu*, *wzy4Strpneu*, *wzy6bStrpneu*, *xpt*;
- (xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStrgal*,
 30 *cpsJStrgal*, *cpsKStrgal*, *cpsMStrgal*, *cpsYStrgal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*, *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*,

0504Straga, foldStraga, neuA1Strgal, neuB1Strgal, neuC1Strgal, neuD1Strgal, recNStraga, ileSStraga;

(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog, fah_rph_hlo_Strpyog, int, int315.5, oppD, , SpyM3_1351, vicXStrpyog;*

5 (xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut, 580SStprmut, 581_582SStprmut, 584SStprmut, dltAStrmut, dltBStrmut, dltCpx1Strmut, dltDStrmut, lichStrbov, lytRStprmut, lytSStprmut, pepQStrmut, pflCStrmut, recNStprmut, ytgBStrmut;*

10 (xix) *Proteus mirabilis* including gene probes derived from *atfA, atfB, atfC, ccmPrmi1, cyaPrmi, flfB, flfD, flfN, flhD, floA, ftsK, gstB, hemCPrmi, hemDPrmi, hev, katA, lpp1, menE, mfd, nrpA, nrpB, nrpG, nrpS, nrpT, nrpU, pat, pmfA, pmfC, pmfE, ppaA, rsbA, rsbC, speB, stmA, stmB, terA, umoA, umoB, umoC, ureR, xerC, ygbA;*

15 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu, frdC, frdD, lad, tna2;*

(xxi) *Acinetobacter baumannii* including gene probes derived from *carO, gacS, dhbA, dhbB, sid, csuD, csuC, tnp-ACIBA, waaA-ACIBA, csuB, csuA_B, csuA, put1, por, abc, furACIBA, dec, cysI, trpE, put3, ompA-ACIBA; and/or*

(b) virulence gene probes for

20 (i) *Staphylococcus aureus* including gene probes derived from *bsaE, bsaG, cap5h, cap5i, cap5j, cap5k, cap8H, cap8I, cap8J, cap8K, I-hld, I-hysA, I-IgGbg, EDIN, eta, etb, hglA, hglB, hglC, hla, hlb, lukF, lukS, NAG, sak, sea, seb, sec1, seg, seh, sel, set15, set6, set7, set8, sprV8, tst, I-sdrC, I-sdrD, I-sdrE;*

25 (ii) *Escherichia coli* including gene probes derived from *b1202, eae, eltB, escR, escT, escU, espB, fes, fteA, hlyA, hlyB, iucA, iucB, iucC, papG, rfbE, shuA, SLTII, toxA-LTPA, VT2vaB;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD, hld_orf5, icaC, icaD, icaR, psm_beta1and2, purR, spoVG, yabJ;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt;*

30 (v) *Staphylococcus lugdunensis* including gene probes derived from *fbIStalugd, slushABCStalugd;*

- (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1, CDC28, CLN2, CPH1, CYB1, EFG1, MNT1, RBF1, RBF1, RIM101, RIM8, SEC14, SEC4, TUP1, YPT1, ZNF1CZF1*;
- 5 (viii) *Enterococcus faecalis* including gene probes derived from *asa1, asp1, cgh, cyla, cyIB, cyII, cyLL_cylS, cyIM, ace, ef00108, ef00109, ef00111, ef00113, ef0012, ef0022, ef0031, ef0032, ef0040, ef0058, enIA, esa, esp, gelE, groEL, groES, rt1, sala, salb, sea1, sep1, vicK, yych, yycI, yycJ*;
- (ix) *Enterococcus faecium* including gene probes derived from *entA_entI, entD,*
 10 *entR, oep, sagA*;
- (x) *Klebsiella pneumoniae* including gene probes derived from *cim, aldA, hemly, pSL017, pSL020, rcsA, rmlC, rmlD, waaG, wbbD, wbbM, wbbN, wbdA, wbdC, wztKpn, yibD*;
- (xi) *P. aeruginosa* including gene probes derived from *aprA, aprE, ctx, algB, algN,*
 15 *algR, ExoS, fpvA, lasRa, lipA, lipH, Orf159, Orf252, pchG, PhzA, PhzB, PLC, plcN, plcR, pvdD, pvdF, pyocinS1, pyocinS1im, pyocinS2, pys2, rbf303, rhlA, rhlB, rhlR, TnAP41, toxA*;
- (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu, lytA, nanA, nanBStrpneu, pcpCStrpneu, ply, prtAStrpneu, pspA, SP0834Strpneu,*
 20 *sphtraStrpneu, wciJStrpneu, wziyStrpneu, wzxStrpneu*;
- (xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor, 0499Straga, hylStragal, lipStragal*;
- (xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog, fba2Strpyog, fhuAStrpyog, fhuB1Strpyog, fhuDStrpyog, fhuGStrpyog, hylA, hylP,*
 25 *hylp2, oppB, ropB, scpAStrpyog, sloStrpyog, smez- Strpyog, sof, speA, speB2Strpyog, speCStrpyog, speJStrpyog, srtBStrpyog, srtCStrpyog, srtEStrpyog, srtFStrpyog, srtGStrpyog, srtIStrpyog, srtKStrpyog, srtRStrpyog, srtTStrpyog, vicKStrpyog*;
- (xvi) *Streptococcus mutans* including gene probes derived from *hlyXStrmut,*
 30 *perMStrmut*;

(xvii) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*, *hpmB*, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*, *patA*, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*; and/or

(c) resistance gene probes derived from genes coding for

- 5 (i) beta-lactams resistance including gene probes derived from *blaIMP-7*, *mecISepid*, *blaOXA-10*, *blaB*, *ampC*, *blaR*, *blaOXA-32*, *bla-CTX-M-22*, *pbp2aStrpneu*, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *mecR*, *blaOXY*, *dacCStrpyog*, *femA*, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*, *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *mecI*, *pbp1a*, *blaI*, *blaTEM-106*, *blaOXY-*
10 *KLOX*, *ftsWEF*, *fmhB*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *fmhA*, *mecR1Sepid*, *blaZ*, *blaOXA-1*, *fox-6*, *blaPrmi*;
- (ii) aminoglycosides resistance including gene probes derived from *aacA_aphDStwar*, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*, ; *aacA4ENCL*, *aac(6p)-lb7*;
- 15 (iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *satA*, *msrA*, *mphBM*, *mefA*, *mrx*;
- (iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;
- (v) chloramphenicol resistance including gene probes derived from *cat*,
20 *catEfaecium*, *cmlA5*;
- (vi) tetracyclines resistance including gene probes derived from *tetA*, *tetL*, *tetM*;
- (vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;
- 25 (viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *alba*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, , *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;
- 30 (ix) fungicide resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

15. The analytical device of any one of claims 1 to 14, wherein

(i) the device comprises the minimal number of species specific gene probes of group (a) as defined in claim 12 or 14 which is sufficient for species identification, preferably the device comprises at least 2 different gene probes per target species of group (a); and/or

(ii) the device comprises the minimal number of virulence gene probes of group (b) as defined in claim 12 or 14 which is sufficient for virulence determination, preferably at least 1 gene probe, more preferably at least 5 different gene probes per target species of group (b); and/or

(iii) the device comprises the minimal number of resistance gene probes of group (c) as defined in claim 12 or 14 which is sufficient for determination of resistance, preferably at least 1 gene probe, more preferably at least 5 different gene probes of group (c); and/or

(iv) the DNA sequences are selected from the group consisting of SEQ ID NOs 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof.

16. The analytical device of claim 15, wherein

(i) the gene probes of group (a) are selected from SEQ ID NO:SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-2863, 2902 and 2903;

(ii) the gene probes of group (b) are selected from SEQ ID NO:100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784; and/or

(iii) the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908.

17. The analytical device of claim 15 or 16, which

(I) is suitable for identification of *Staphylococcus aureus* and comprises one or more or all of the gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58,

59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902, 2903, preferably comprises at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) is suitable for identification of *Escherichia coli* and comprises one or more or all of the gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probe represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) is suitable for identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) is suitable for identification of *Staphylococcus haemolyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) is suitable for identification of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) is suitable for identification of *Staphylococcus warneri* and comprises one or more or all of the gene probes selected from SEQ ID NO:224-228 and 230, preferably at least one of the gene probes represented by SEQ ID NO:224, 226, and 230; and/or

(VII) is suitable for identification of *Staphylococcus saprophyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) is suitable for identification of *Staphylococcus hominis* and comprises one or more or all of the gene probes selected from SEQ ID NO:2096, 194, 229, 211 and 214; and/or

(IX) is suitable for identification of *Candida albicans* and comprises one or more or all of the gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) is suitable for identification of *Enterococcus faecalis* and comprises one or more or all of the gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

- 5 (XI) is suitable for identification of *Enterococcus faecium* and comprises one or more or all of the gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) is suitable for identification of *Klebsiella pneumoniae* and comprises one or more or all of the gene probes selected from SEQ ID NO:399, 401-404, 408-415,
10 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

(XIII) is suitable for identification of *Klebsiella oxytoca* and comprises one or more or all of the gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

- 15 (XIV) is suitable for identification of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) is suitable for identification of *Streptococcus pneumoniae* and comprises one
20 or more or all of the gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

(XVI) is suitable for identification of *Streptococcus agalactiae* and comprises one or more or all of the gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO:606 and 619; and/or

- 25 (XVII) is suitable for identification of *Streptococcus pyogenes* and comprises one or more or all of the gene probes selected from SEQ ID NO:645-648, 652, 655-656, 658 and 660, preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) is suitable for identification of *Streptococcus mutans* and comprises one or
30 more or all of the gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

(XIX) is suitable for identification of *Proteus mirabilis* and comprises one or more or all of the gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

- 5 (XX) is suitable for identification of *Proteus vulgaris* and comprises one or more or all of the gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene probes represented by SEQ ID NO:776, 777 and 781; and/or

- 10 (XXI) is suitable for identification of *Acinetobacter baumannii* and comprises one or more or all of the gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

18. The analytical device of claim 17, which further comprises

- (I) for the characterisation of *Staphylococcus aureus*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141, and/or
15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

- (II) for the characterisation of *Escherichia coli*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
20 2888, 2907-2908; and/or

- (III) for the characterisation of *Staphylococcus epidermidis*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
2888, 2907-2908; and/or

- 25 (IV) for the characterisation of *Staphylococcus haemolyticus*: one or more or all of the gene probe of group (b) represented by SEQ ID NO:215, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(V) for the characterisation of *Staphylococcus lugdunensis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:220-221, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VI) for the characterisation of *Staphylococcus warneri*: one or more or all

5 of the gene probe of group (b) represented by SEQ ID NO:230, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VII) for the characterisation of *Staphylococcus saprophyticus*: one or more or all

10 of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VIII) for the characterisation of *Staphylococcus hominis*: one or more or all

of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(IX) for the characterisation of *Candida albicans*: one or more or all

15 of the gene probes of group (b) selected from SEQ ID NO:292-307, and/or

of the gene probes of group (c) selected from SEQ ID NO:910-918; and/or

(X) for the characterisation of *Enterococcus faecalis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:343-376, and/or

20 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XI) for the characterisation of *Enterococcus faecium*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:394-398, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

25 (XII) for the characterisation of *Klebsiella pneumonia*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:432-448, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIII) for the characterisation of *Klebsiella oxytoca*: one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIV) for the characterisation of *Pseudomonas aeruginosa*: one or more or all

5 of the gene probes of group (b) selected from SEQ ID NO:491-522, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XV) for the characterisation of *Streptococcus pneumoniae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:592-605, and/or

10 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVI) for the characterisation of *Streptococcus agalactiae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:640-644, and/or

15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVII) for the characterisation of *Streptococcus pyogenes*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:657-686, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

20 (XVIII) for the characterisation of *Streptococcus viridans*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:702-705, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIX) for the characterisation of *Proteus mirabilis*: one or more or all

25 of the gene probes of group (b) selected from SEQ ID NO:750-775, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XX) for the characterisation of *Proteus vulgaris*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:782-784, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

(XXI) for the characterisation of *Acinetobacter baumannii*: one or more or all

5 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

19. Use of the analytical device of any one of claims 1-18 for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably for the diagnosis of a clinical condition, more preferably for the diagnosis
10 of bacteremia, fungemia or sepsis.

20. Use of the analytical device of any one of claims 1-18 for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain contained in a mixture of a plurality of microorganisms.

15 21. An *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

(a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule;

20 (b) applying the DNA thus obtained to the analytical device of anyone of claims 1-18 and hybridising the DNA with the gene probes of the analytical device; and

(c) detecting DNA bound to the analytical device by determination of the amount of the reporter molecules bound to the device.

22. The method of claim 21,

(i) which is a method for diagnosis of bacteremia, fungemia or sepsis; and/or

25 (ii) wherein the clinical specimen is a positive blood culture; and/or

(iii) wherein the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than 100 %, preferably from 1% to 99%; and/or

(iv) wherein the reporter molecule is a fluorochrome; and/or

30 (v) wherein the determination of the amount of reporter molecules bound to the device is achieved by visualization of the reporter molecule; and/or

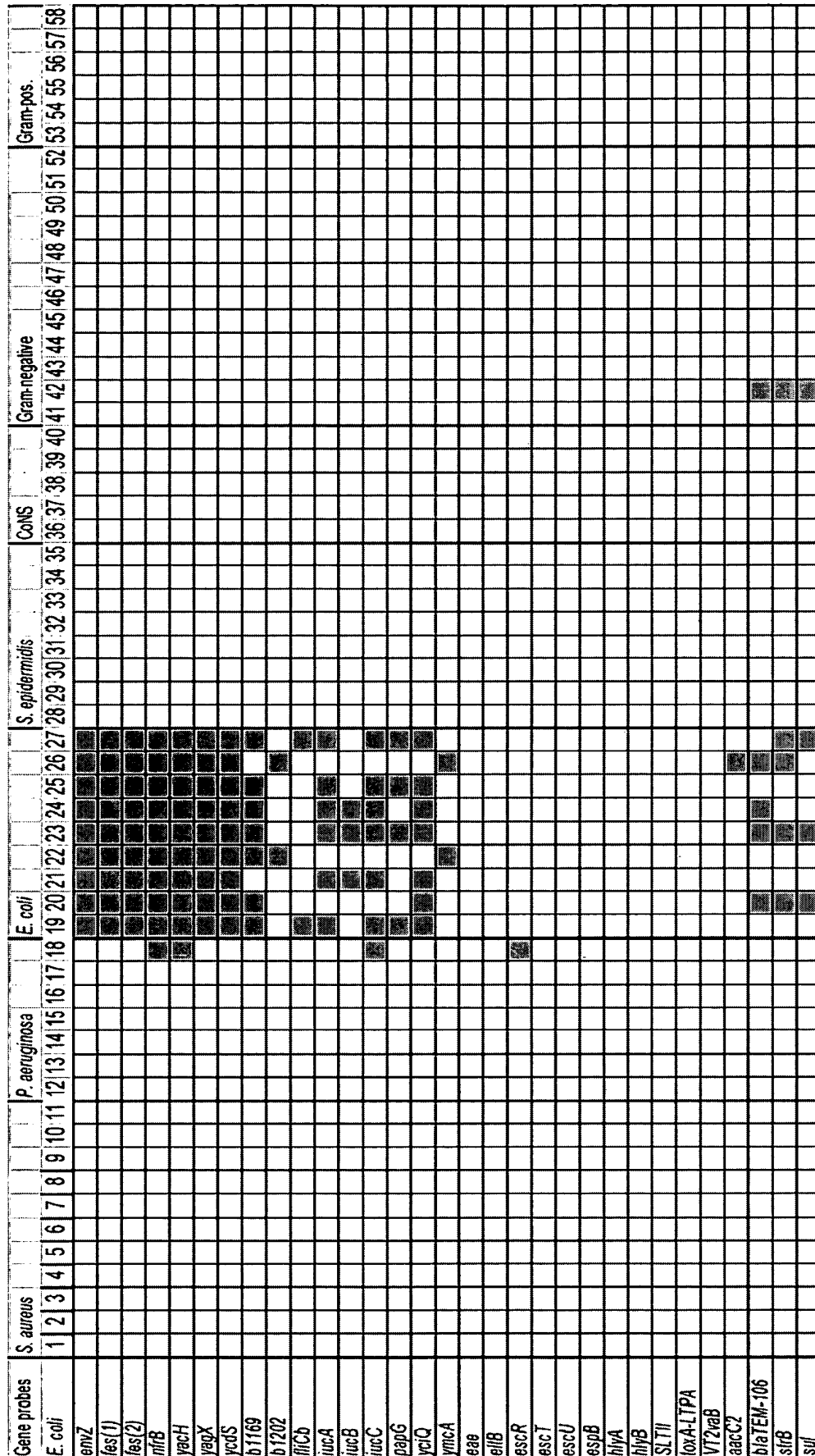
(vi) wherein the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming; and/or

(vii) wherein the DNA isolated in step (a) is fragmented before the labelling reaction.

5 23. The method of claim 21 or 22, wherein the analytical device is a DNA microarray and the detection is preferably performed using a DNA microarray reader.

10 24. The method of claim 21 or 22, wherein the analytical device is a DNA coated bead or a set of DNA coated beads, and the application and/or detection step is preferably performed in a microfluidic device.

25. A kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of any one of claims 1 to 18.



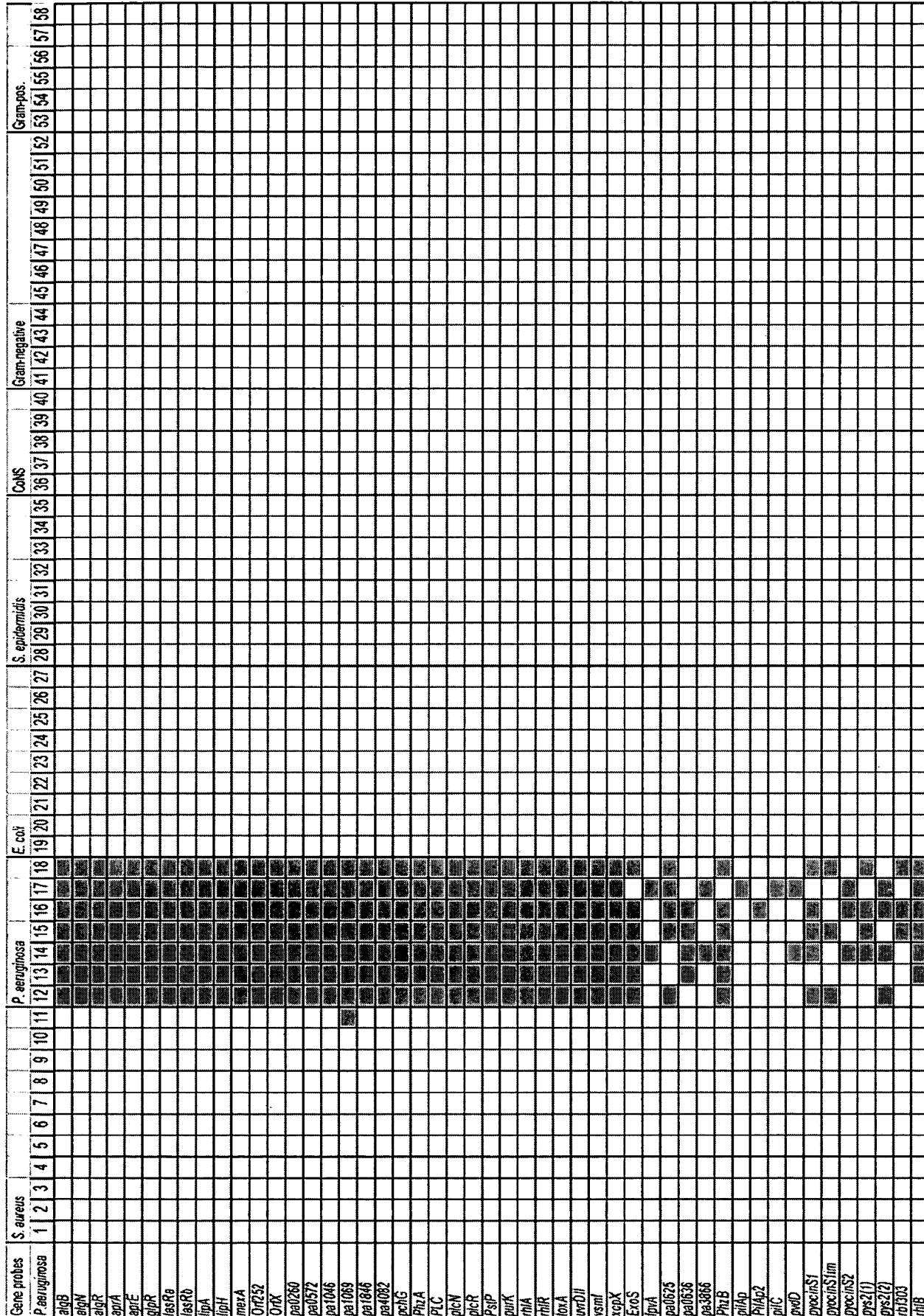
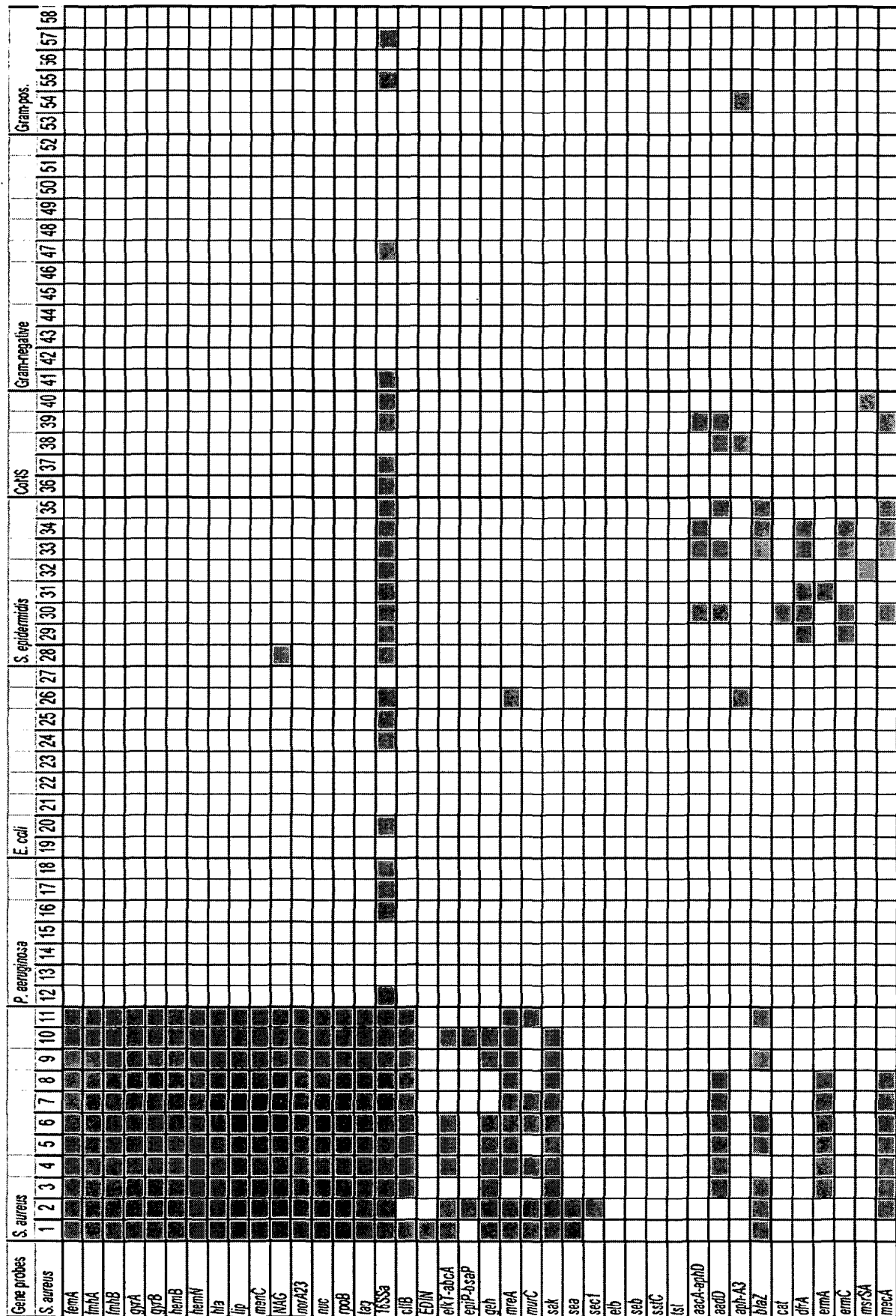
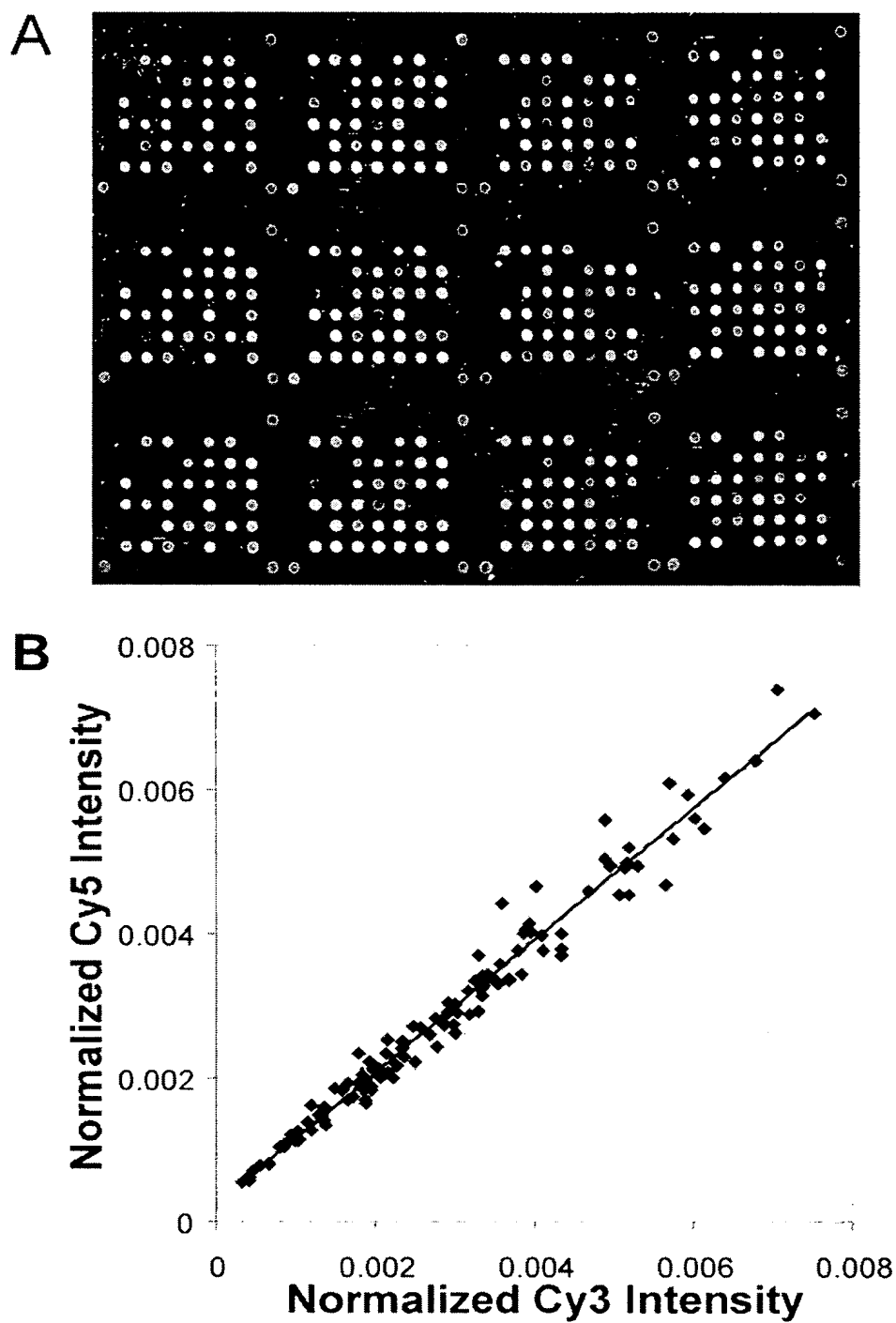


Fig. 1B



**Fig.2**

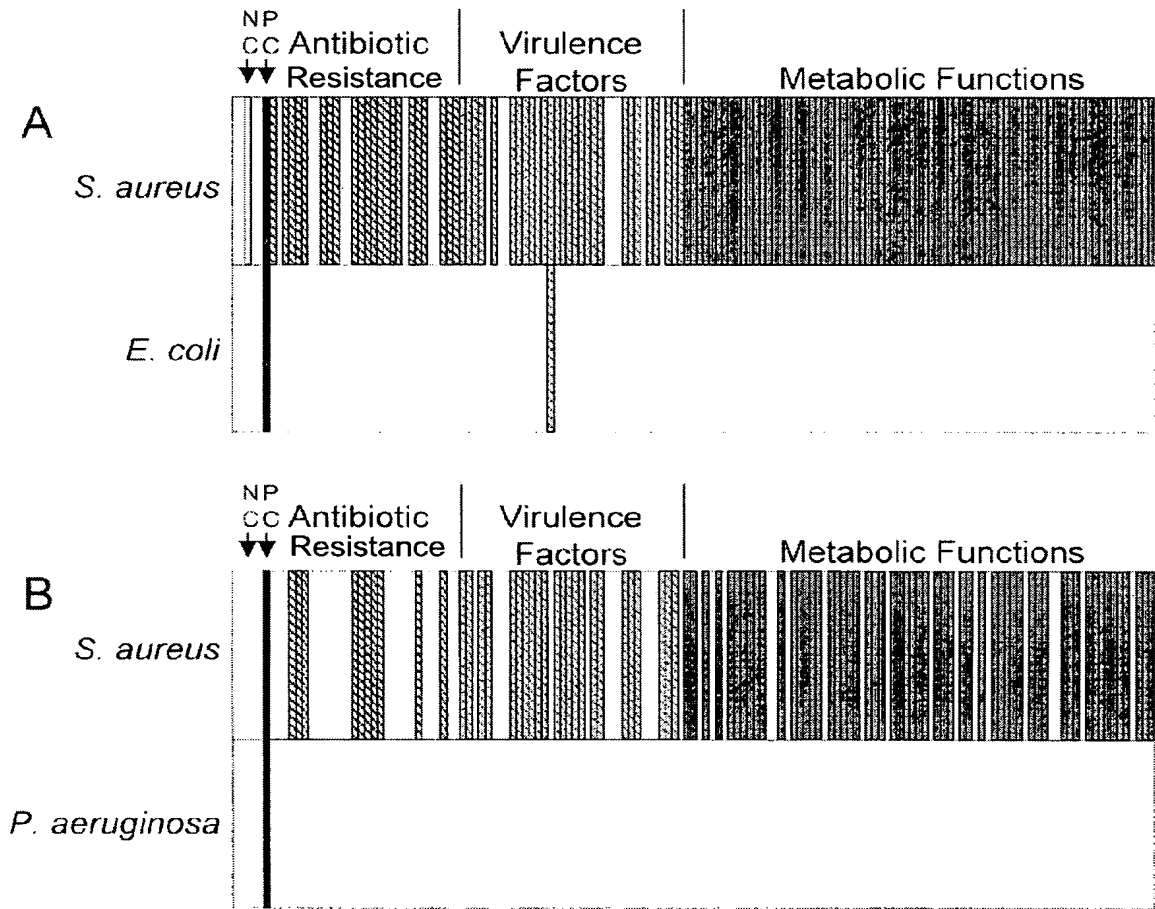


Fig.3

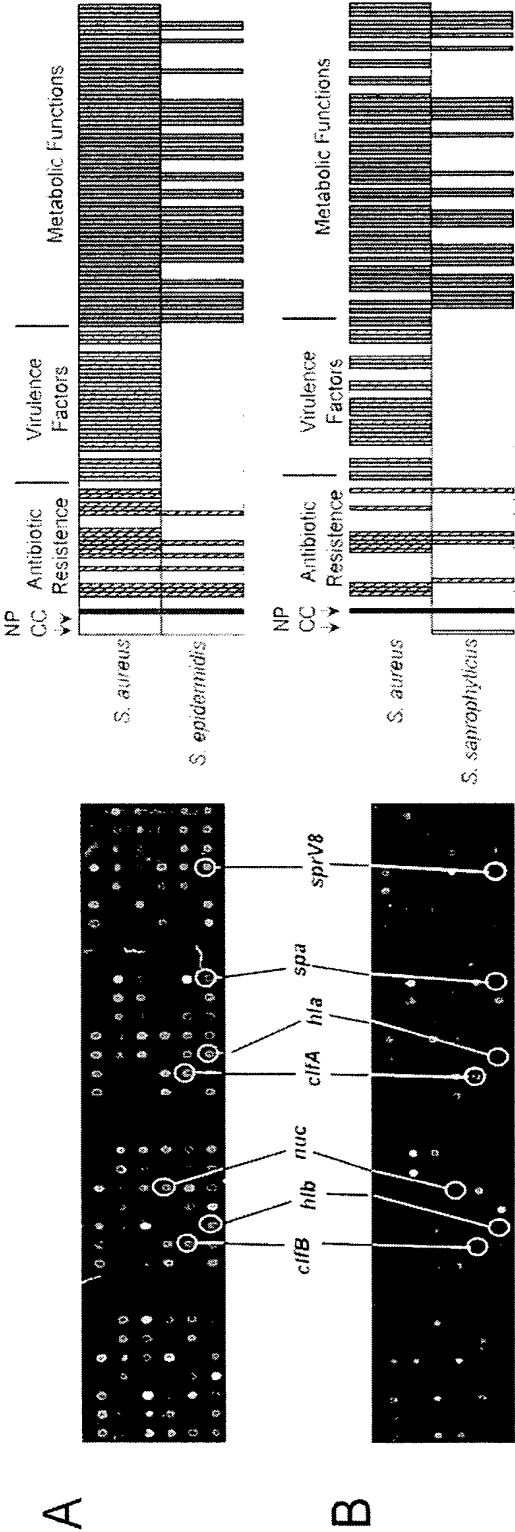
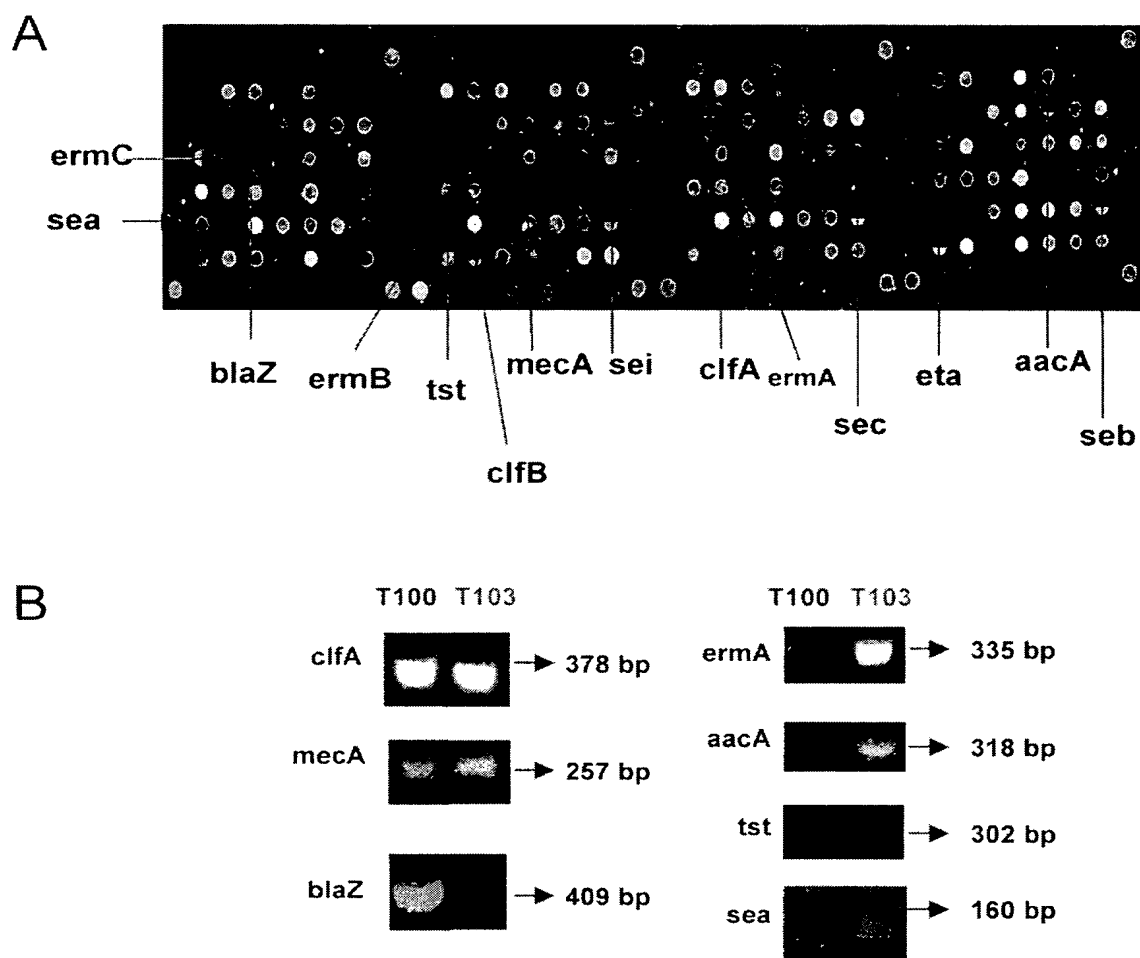


Fig.4

**Fig.5**

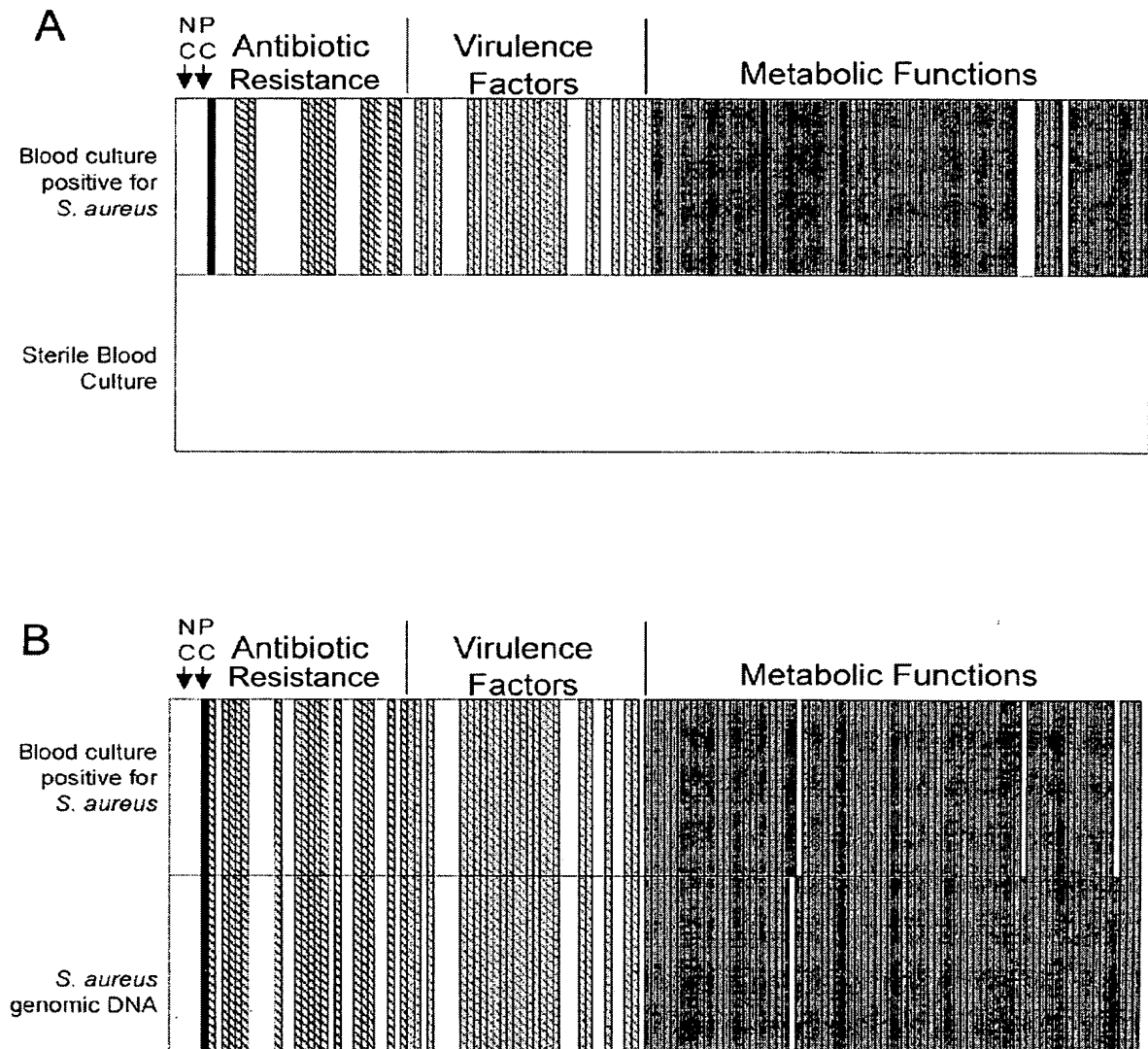
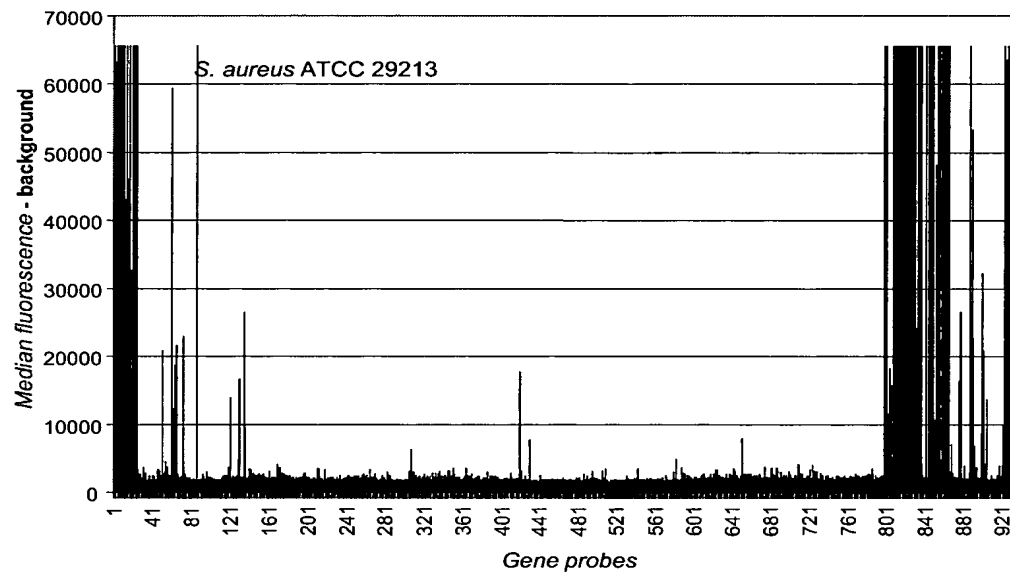
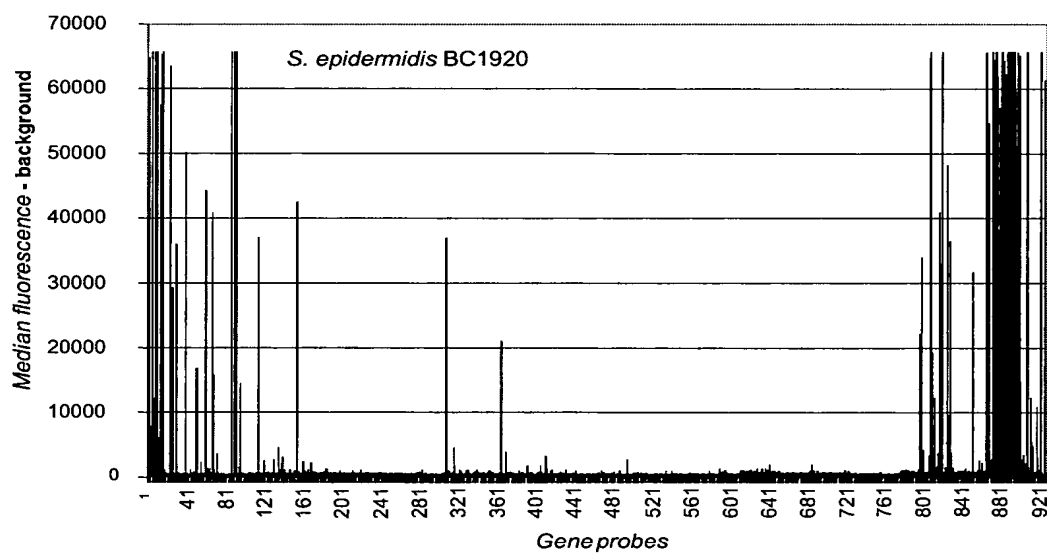
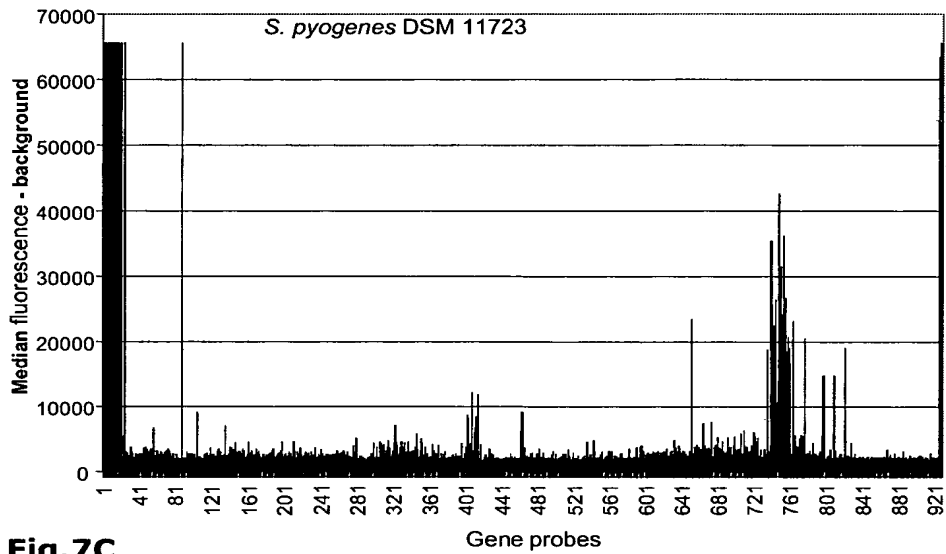
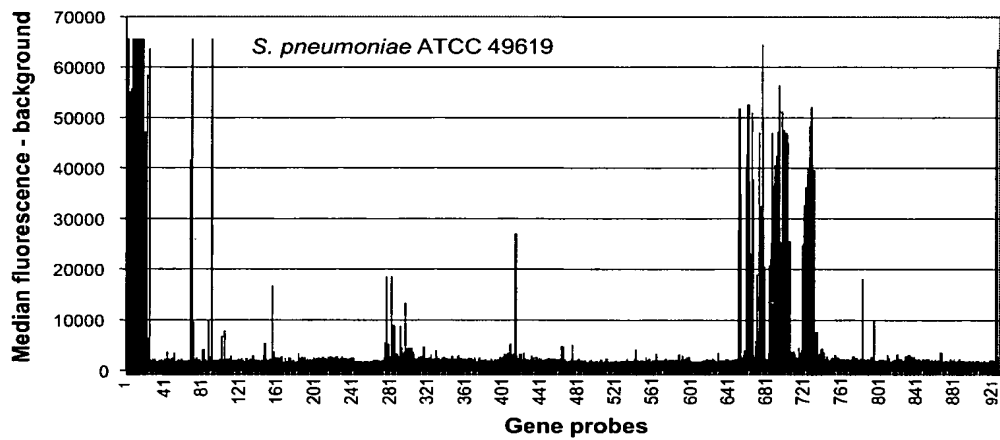
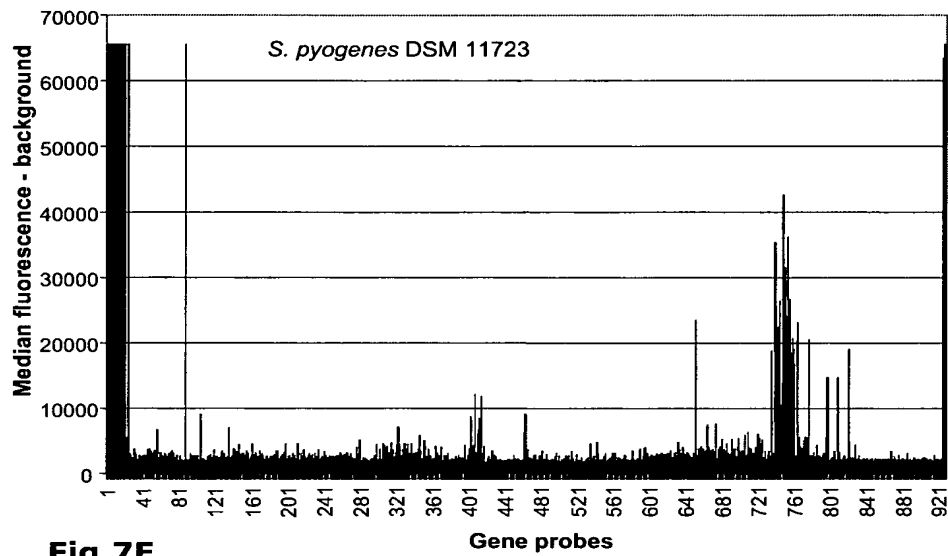
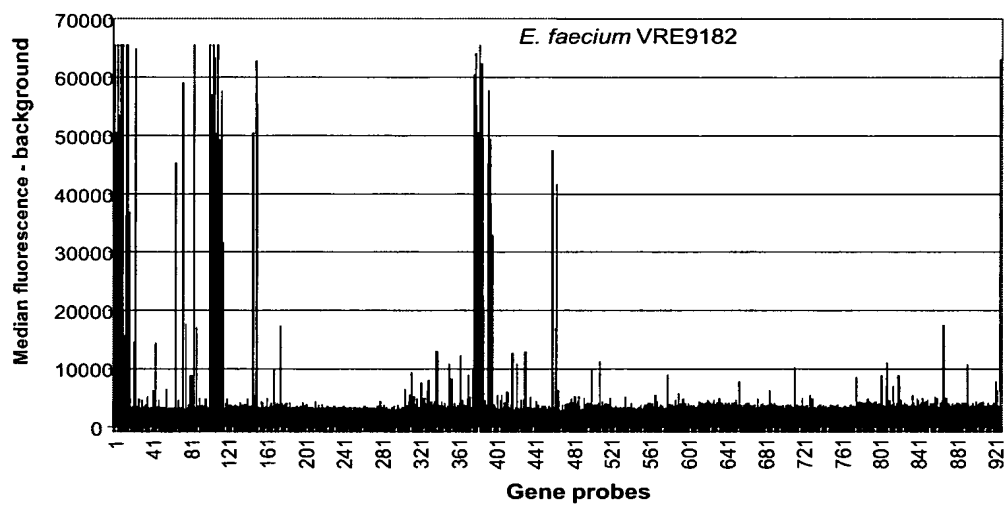
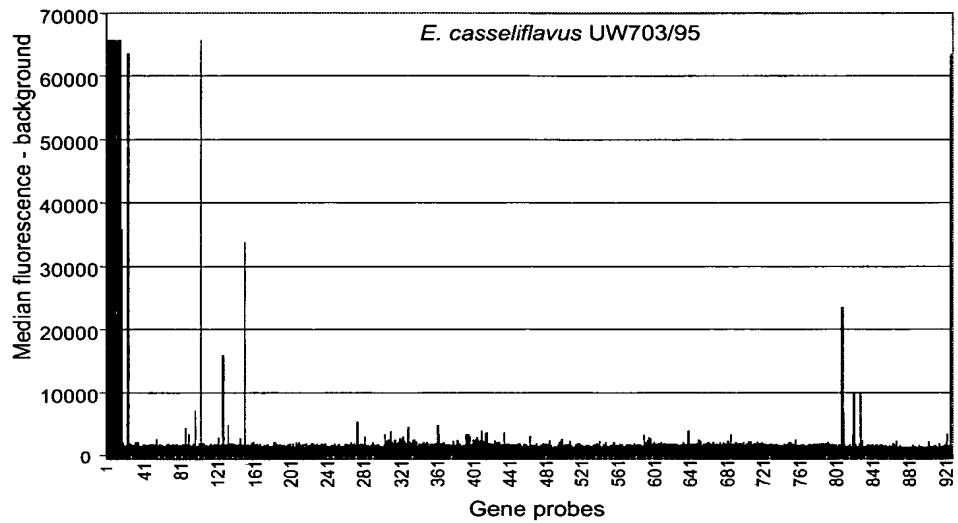
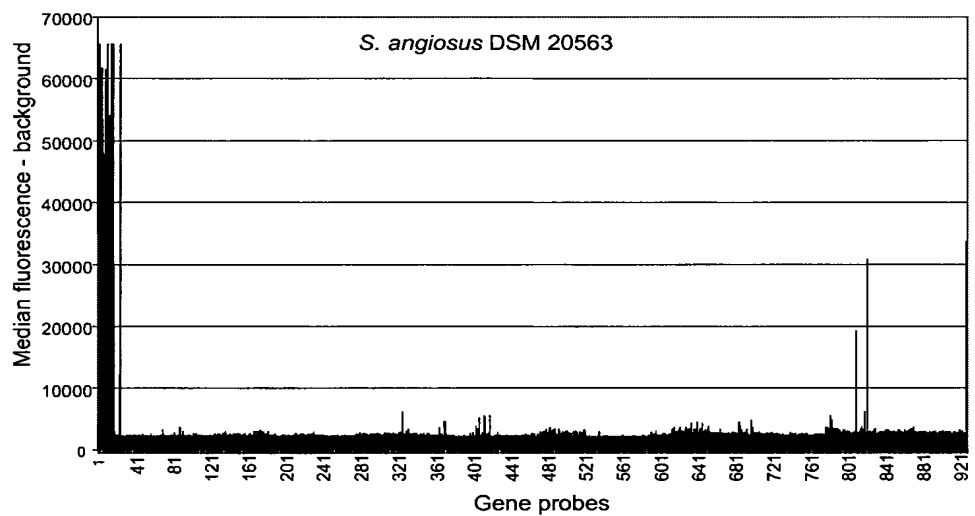


Fig.6

**Fig.7A****Fig.7B**

**Fig.7C****Fig.7D**

**Fig.7E****Fig.7F**

**Fig.7G****Fig.7H**

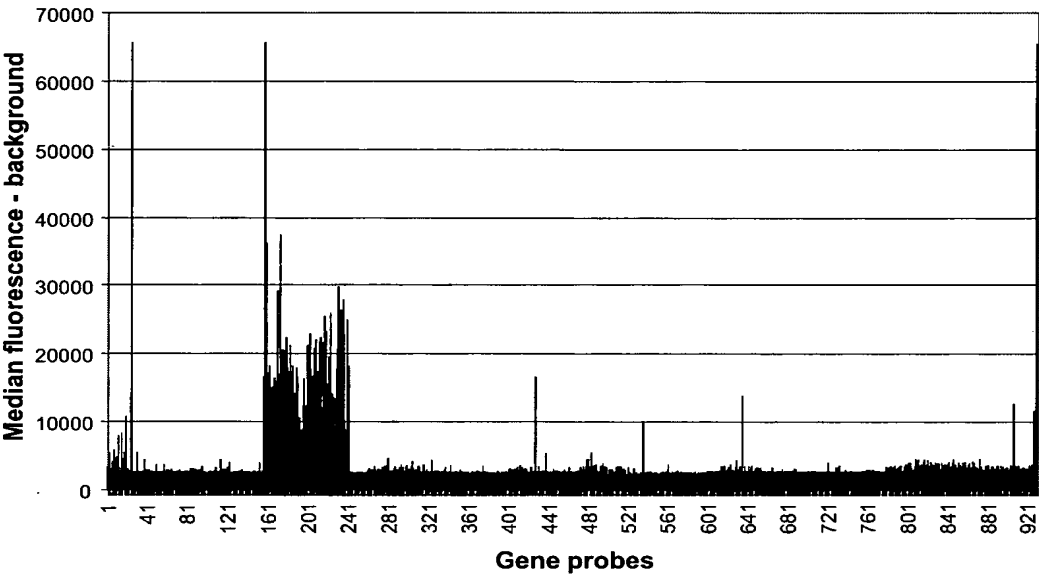


Fig.8A

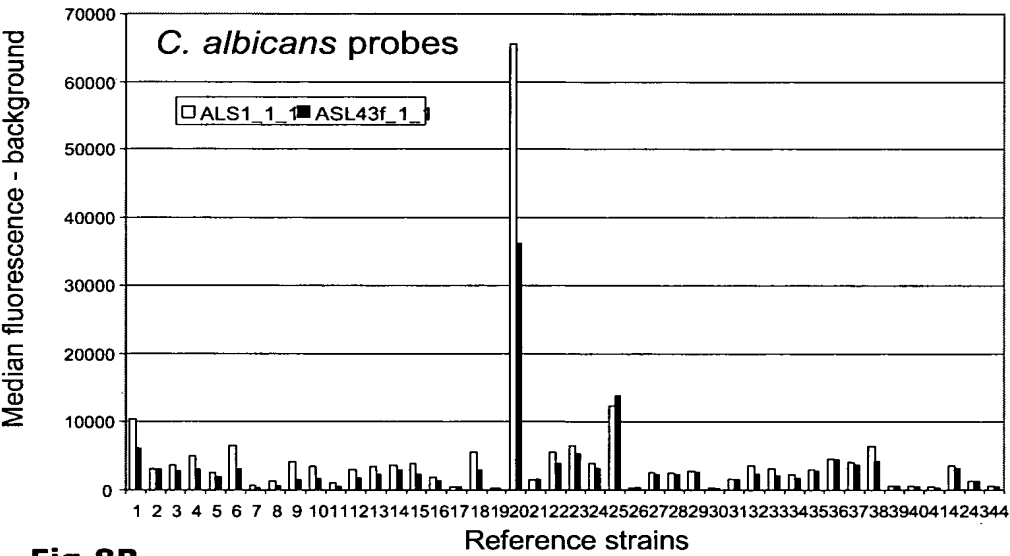


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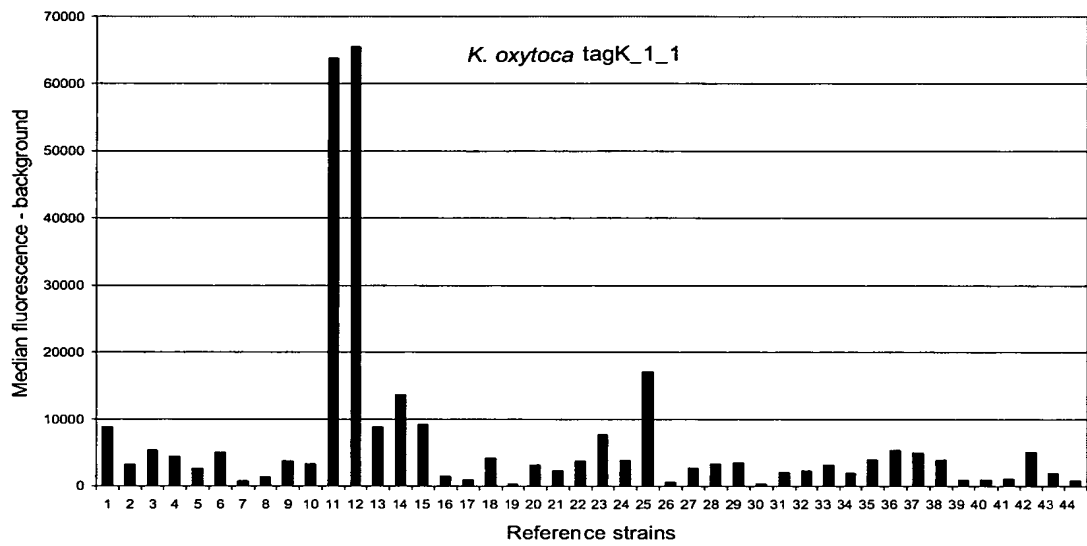


Fig.9A

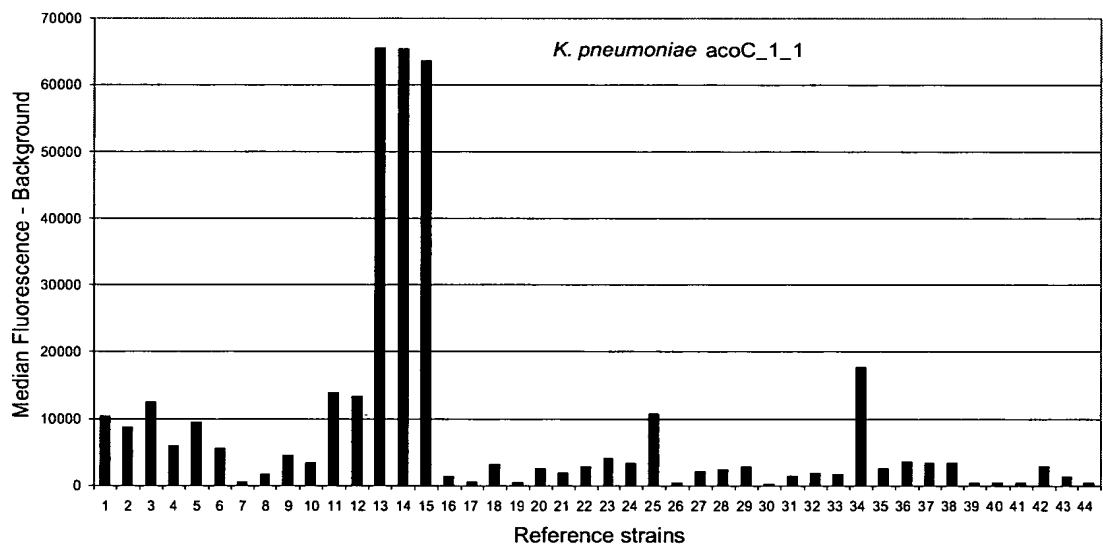


Fig.9B

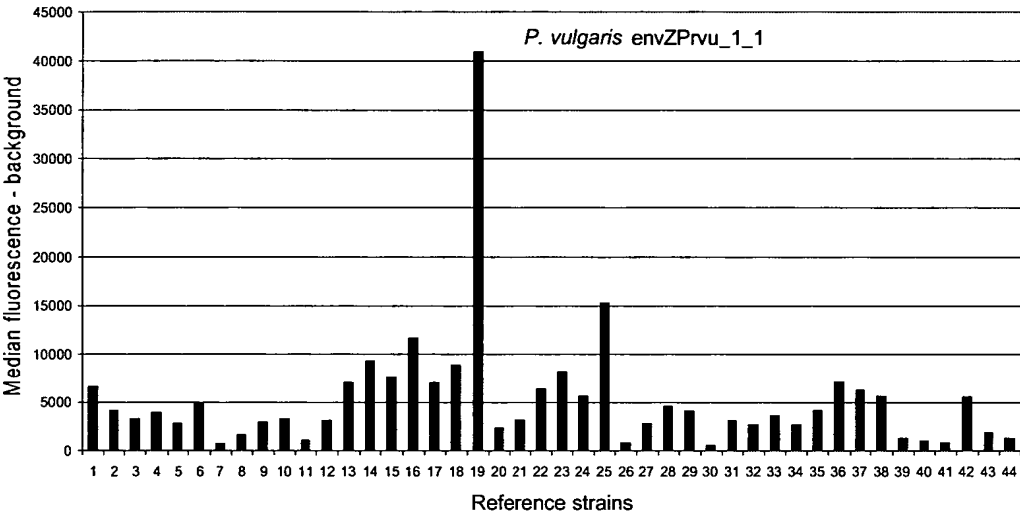


Fig.9C

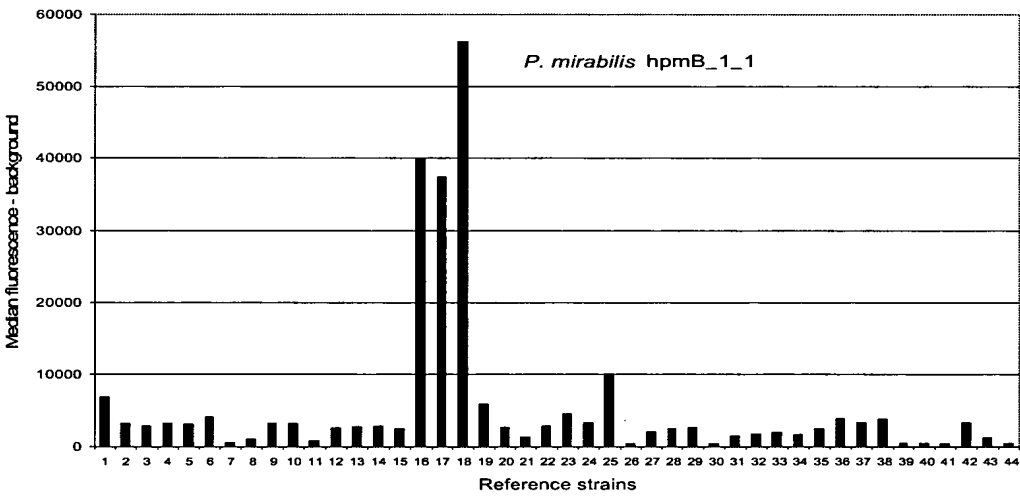


Fig.9D

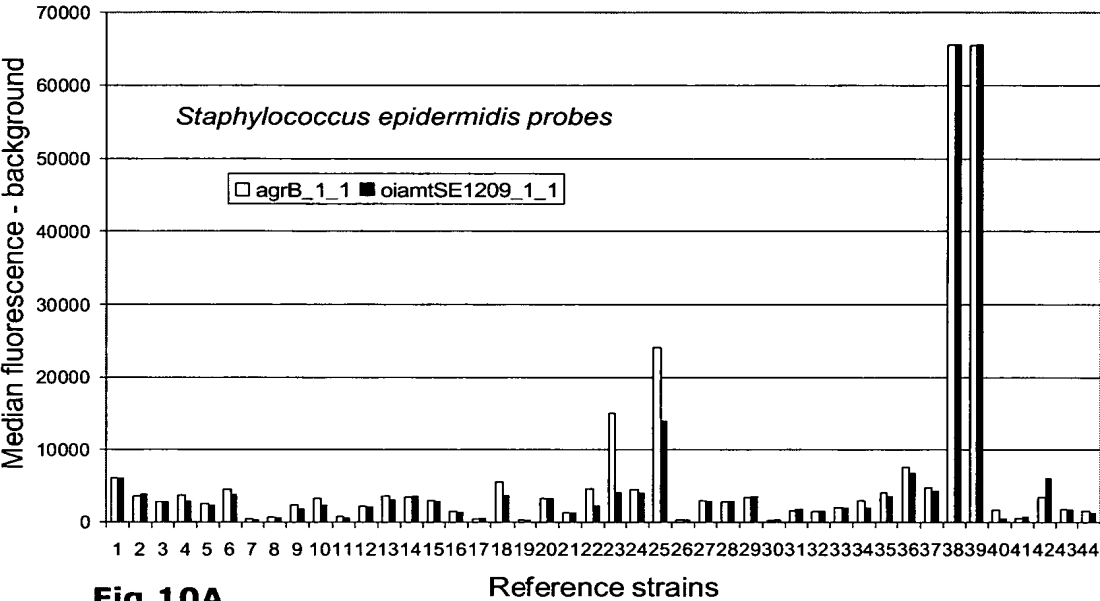


Fig.10A

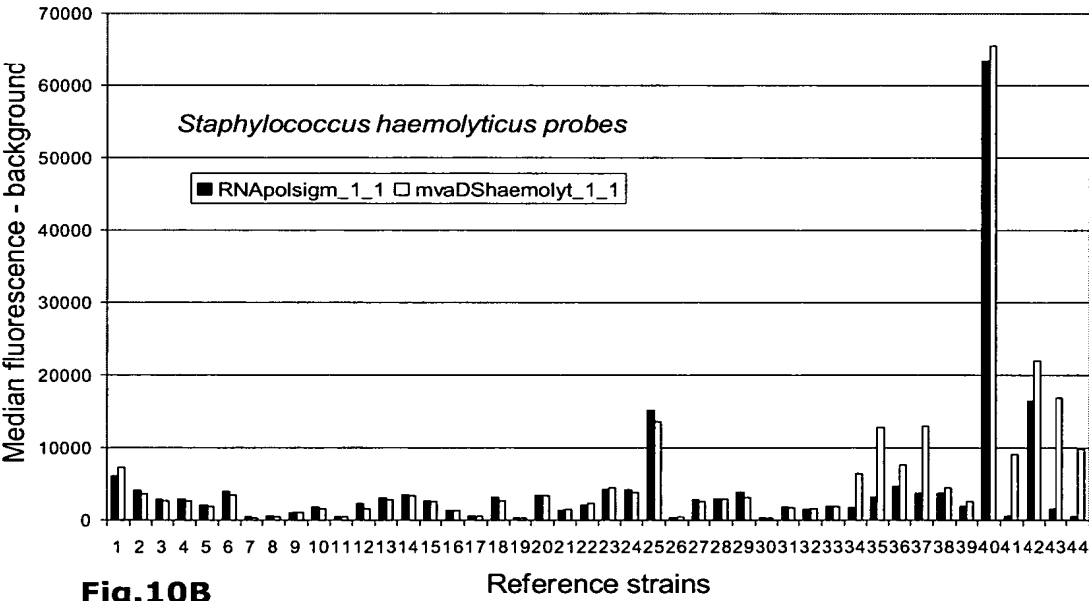


Fig.10B

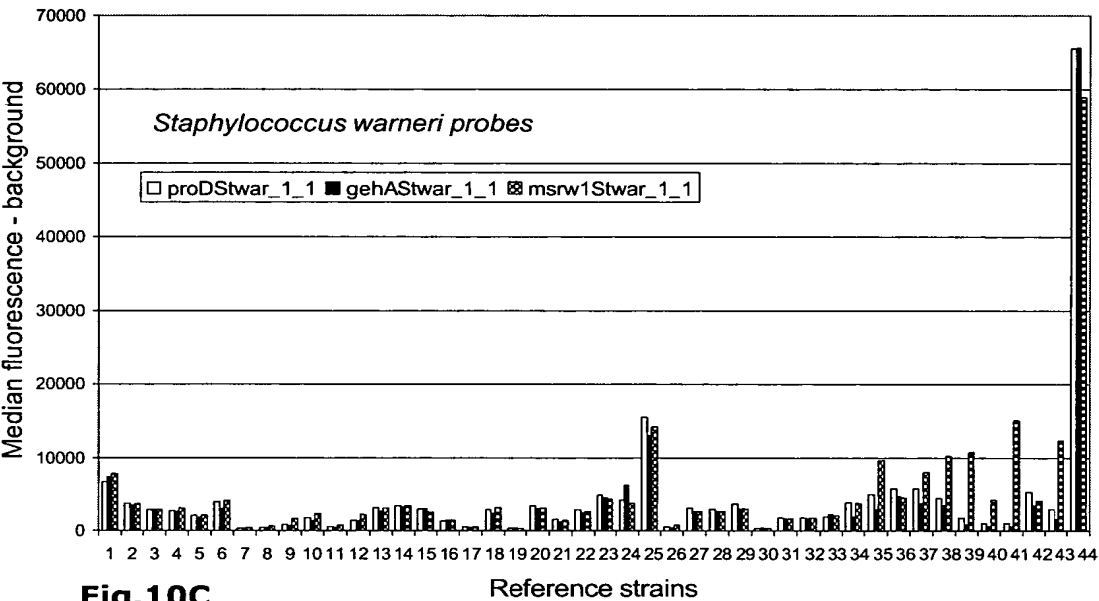


Fig.10C

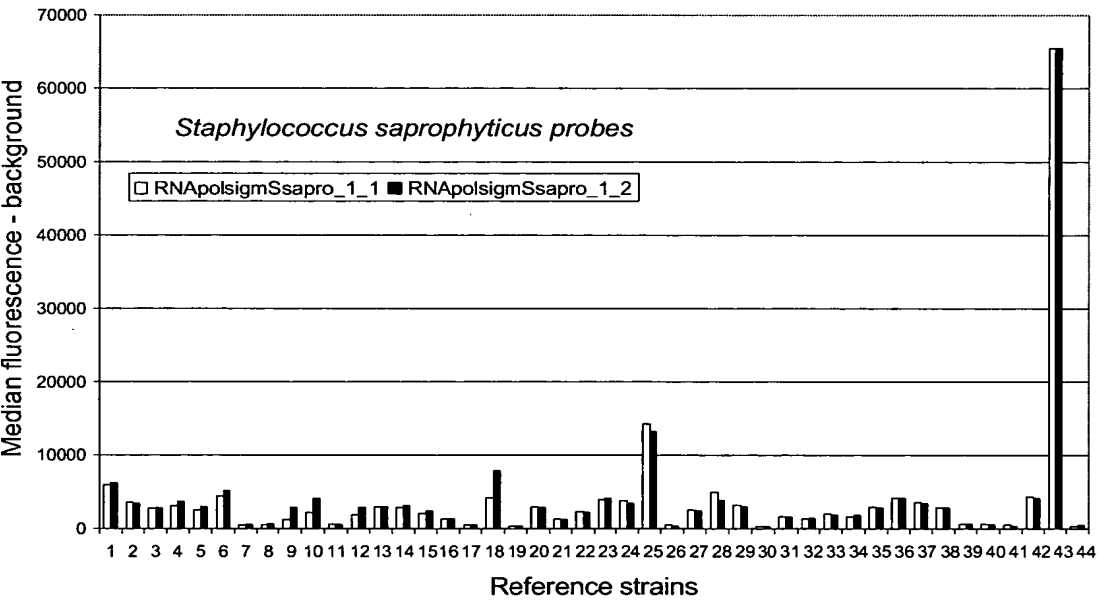


Fig.10D

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<130> 062148wo/JH/PCH

<150> EP 05109025.6

<151> 2005-09-29

<160> 3042

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 atgaaggaaa agaagttttg catgacgtgg ctacattttc aggtgaagca aatggtatag 360
 aggtagacgt agctttccaa tataatgatc aatattcaga aagtatttta agttt 415

<210> 21
 <211> 206
 <212> DNA
 <213> Staphylococcus aureus

<400> 21
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 ttgctgaatt agaacgcca tacattttag taacagataa gaaaatctcg tctttccaag 120

atatcttacc tttattagaa caagtgggtc aatctaattcg tccaatctta attgtagctg 180
atgaagttga aggcgatgca ttaaca 206

<210> 22
<211> 380
<212> DNA
<213> Staphylococcus aureus

<400> 22
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ttcattttaat accagatatg tttcattatc tcgtttaact tctgtaccag catattgttg 120
gaacacgaca cgggtcccctt ctttcacttc aggagtcact cttgtaccat catttaatag 180
gcgtccagtt cctactgcaa cgataacgcc ttcgtttgat ttttcttttag cactatcagt 240
taaaacaata ccacttttag ttgtttgttc ttgttctttt ttctcaataa tcacacgatt 300
tccaattggg tttagcatga ttgttcctcc ttaaaaaacc taaagtttag cacttaacat 360
taaagagtgc taacatacat 380

<210> 23
<211> 496
<212> DNA
<213> Staphylococcus aureus

<400> 23
tgtcatatta tcaacatgta atcgaactga agtatatgct gttgttgatc aaattcacac 60
aggtcgttac tatattcaac gattttctagc tcgtgcattt ggatttgaag tagatgatat 120
taaagcaatg tcagaagtaa aagtggggga cgaagcagta gaacatttat tgcgtgtcac 180
ttctggttta gattcaatcg tacttggaga aactcaaatt ttaggtcaaa taagagatgc 240
atttttctta gcgcaaagca caggtacgac aggaacaatt tttaatcatc tatttaaaaca 300
ggcaattact tttgcaaaaa gagcacataa tgaacagat atagctgata atgctgtaag 360
tgtgtcttat gctgcggtcg agttggcgaa aaaagtatct ggcaaattga aaagtaagca 420
agctatcatt attgggtgcag gggaaatgag tgaattatca ctattaaatc ttcttggttc 480
tggaattact gatatt 496

<210> 24
<211> 619
<212> DNA
<213> Staphylococcus aureus

<400> 24
 aaaatgatca aaggtgaaga aacatcacat acacctgttt ggtttatgcg acaagctggc 60
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 cagccggagt tgtgcgctta tgtaacacat ttaccagttg ataattatca tacagatgca 180
 gcaattttat acaaagatat tatgacacca ttaaagccaa ttggtgtcga tgtagaaatt 240
 aaatcgggta ttggtccagt gattcataat ccaatcaaaa caattcaaga tgtagagaaa 300
 ctttctcaaa tagaccccg aagagatgta ccatatgtat tagatacaat taaactttta 360
 acagaagaaa agttaaatgt gccgctaata ggatttactg gggcaccatt tacattagcg 420
 tcatatatga ttgaaggcgg accatcgaaa aattacaatt ttacaaaagc gatgatgtat 480
 agagatgaag caacatggtt tgctttaatg aatcatttag ttgatgtatc tgtaaatat 540
 gtaacagctc aagtcaagc aggtgccgaa ttgattcaaa ttttcgattc atgggtaggt 600
 gcattaaatg tcgaggatt 619

<210> 25
 <211> 578
 <212> DNA
 <213> Staphylococcus aureus

<400> 25
 aatgggatta ttagttatgg cttatggcac accttataaa gaaagtgaca tagagccata 60
 ttatacagat attagacatg gtaaacgtcc atctgaagaa gaacttcaag atttgaaaga 120
 tagatatgaa tttatagggtg gtttatcacc attagcaggt acaacagatg accaggctga 180
 tgcgctagtt tcagcattaa ataaagcata tgcagatggt gaatttaaac tatacttagg 240
 attaaaacac atttcacat ttatcgaaga tgcggttgaa caaatgcaca atgatggcat 300
 tactgaagca atcacggtag tactagcacc acattattct tcattttcag taggatcata 360
 tgacaaacgt gctgatgaag aagctgcaaa atatggtatt caacttacac atgtgaaaca 420
 ttattatgaa caacctaaat ttattgaata ttggacgaat aaagtcaacg aaacattagc 480
 tcaaataccg gaagaggaac ataaagacac ggtattagtt gtttcggcac atagtttgcc 540
 aaaaggttta atcgaaaaga ataatgatcc atatccac 578

<210> 26
 <211> 382
 <212> DNA
 <213> Staphylococcus aureus

<400> 26
 atgagatata cgaaatcaga agaagcaatg aaggttgctg aaactttaat gcctgggtggt 60
 gtaaatagtc cagtacgcgc atttaaatca gtagatacac cagcaatddd tatggatcac 120
 ggtaaagggtt caaaaattta tgatatcgat ggtaacgagt atatcgacta tgtactaagt 180
 tggggggccac ttatdddtagg acatagagac cctcaagtta ttagtcatddd acatgaagca 240
 attgataaag gtacaagtdt tggtgcatca acattacttg aaaataaatt ggcgcagctc 300
 gttattgacc gagtaccttc aatagaaaaa gtgcgtatgg tgtcatctgg tacagaagct 360
 acattggata ctdtaagatt ag 382

<210> 27
 <211> 1099
 <212> DNA
 <213> Staphylococcus aureus

<400> 27
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 ggtagaaaaa cgattatgac agaattagcg aaagatattg gattagaaca agatattggt 180
 acaaatacga ctggacaatc atatattdtdt gcgaaaaaca aattgtatcc tattccaggt 240
 ggatcaatta tgggaattcc gacagatatc aaaccgttdg tgacaactaa attaattdca 300
 ccacttggt aattaagagc aggattagat ttaatcaaaa agcctataca aatgcaagat 360
 ggtgacattd ctgtdggtgc attdtdcaga gcaagattag gtaatgaggt acttgagaat 420
 ttaatagagc ctdtaatggg tggtattdtat ggtaccgata ttgataaatt aagtdtgatg 480
 agtacgttdc ctaattdtda agaaaaagaa gaggcattcg gaagtctgat aaaaggatg 540
 aaggatgaga aaaataagcg tctgaaacaa agacaattat atcctggcgc accaaaagga 600
 caattcaaac aattdaagca tggtdtaagt tcatttdatg aagcattaga acaagatgtg 660
 aaaaataaag gtgtgacaat acgctacaat acgtcagtdg atgatattat tacatctcaa 720
 aagcaatata aaatgtdtda cagtaatcaa caagaagatg tattcgatgg ggtattagtg 780
 acaacaccgc atcaagtctt ttdgaattdg ttcggacaag atccagcatt tgattacttdt 840
 aaaacgatgg atagtacgac tgttgcaact gtdgtattdg catttgatga aaaagatatt 900
 gaaaatactt atgatggtac tggcttcgtg attgcgagaa cgagtgatac agacattacc 960
 gcatgtactt ggacatcgaa aaaatggcca ttdactacac cagaaggtaa ggttdtdgatt 1020

cgtgcgtatg taggtaaacc aggtgatact gtggttgatg atcatacaga taatgaatta 1080
gtatcgattg tacgtagag 1099

<210> 28
<211> 629
<212> DNA
<213> Staphylococcus aureus

<400> 28
attaacaaaa ttgatttacc tgctgcagaa cctgaacgcg tgaacaaga aattgaagat 60
atgataggtt tagaccaaga cgatgttggt ttagcaagtg ctaaactctaa cattggaatt 120
gaagagatac tagagaaaat agttgaagtt gtgccagctc cagatggcga ccagaagca 180
ccactaaaag cgtaaatatt tgattctgag tatgatccat atagaggggt aatttcatcg 240
ataagaattg tagacggtgt tgttaaagcc ggagataaaa ttcgaatgat ggcgactggt 300
aaagagttcg aagtaacaga agttggaatt aatacaccta agcagcttcc agttgatgaa 360
ttaacagttg gtgatgttgg ttatattatt gcaagtatta aaaatgttga tgattctagg 420
gttggtgaca ccatcacatt agctagtaga cctgcacag aaccattgca aggttataag 480
aaaatgaatc caatgggtata ttgcggactg ttccaatag ataacaaaaa ttataatgat 540
ttaagagaag cattagaaaa attacaattg aatgatgcat cattagaatt tgagcctgaa 600
tcgtcacaag cattagggtt tggttatag 629

<210> 29
<211> 265
<212> DNA
<213> Staphylococcus aureus

<400> 29
aaagacgcat caaaaccagc acactttttt caccaagtca ttgtaattgc ttagtactc 60
tttgtatoga aaataattga atcatattatg ccaattocta tgcctggatc agtaatcggg 120
ttagtattat tatttgtatt attatgtact ggtgctgtta agttaggcga agtcgaaaaa 180
gtaggaacga cactaacaaa taacattggc ttactcttcg taccagccgg tatctcagtt 240
gttaactott taggtgtcat tagcc 265

<210> 30
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 30
 gattaaccac ttagcactaa atacacctta cttcggaata ctgttatccg ttataccatt 60
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 tgtcagtatg gtatttggtg tggccttcct ctatttaaca ggcattccgt ataagactta 180
 caaaataggt ggagacatta ttactttctt cttagaaccg gcaacaatct gttttgcgat 240
 tccgttatat aaaaagcgtg aagtgccttg taaacatt 278

<210> 31
 <211> 388
 <212> DNA
 <213> Staphylococcus aureus

<400> 31
 cgacaaacac ccaacaagca catacacaaa tgtcaacaca atcacaagac gtatcttatg 60
 gtacttatta tacaattgat tctaattggg attatcatca cacacctgat ggtaactgga 120
 atcaagcaat gtttgataat aaagaatata gctatacatt cgtagatgct caaggacata 180
 cgcattatit ttataactgt tatccaaaaa atgcaaatgc caatggaagc ggccaaacat 240
 atgtgaatcc agcaatagca ggagataaca atgactacac agcgagtcaa agccaacagc 300
 atattaatca atatggttat caatcaaagc taggtccaga cgcgagctat tattcacata 360
 gtaacaacaa ccaagcgtat aacagcca 388

<210> 32
 <211> 203
 <212> DNA
 <213> Staphylococcus aureus

<400> 32
 gttatcgtat taactggtga aggtgattta gcattctggt ctggtggtga ccagaagaaa 60
 cgtggacatg gtggttatgt aggtgaagac caaatccctc gcttaaattgt attagattta 120
 cagcgtttta ttctgtattat tccaaaaccg gttatcgcga tggtaaaagg ttatgctgta 180
 ggtggcggta atgtactaaa tgt 203

<210> 33
 <211> 1434
 <212> DNA
 <213> Staphylococcus aureus

<400> 33
 cgtaaggga gtagttatca gtccgggatc acgtcaacg ccacttgac ttgcatttga 60

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agcacatcca aatattaaaa catggataca ccccgatgag cgaagtgcag cattttttgc 120
agttgggtta attaaaggta gtgaaagacc tgtcgctata ttatgtacgt caggtacagc 180
agcagcgaat tatacgctg caattgctga aagccaaatt agtagaattc cattaatcgt 240
tttaacaagt gaccgtccgc atgaattaag aagtgtaggc gcaccacaag cgattaatca 300
agtaaataatg tttaataatt atgtaagtta tgagttcgat atgcctattg cggatgatag 360
taaagagacc attaatgcaa tttattatca aatgcaaatt gctagtcaat atttatatgg 420
accacataaa gggccaattc attttaactt gccatttaga gatccgttaa cacctgattt 480
gaatgcaaca gaattgttaa cttctgagat gaagatttta ccgcactatc aaaaaagtat 540
agatgcatcg gcattaagac acattttaaa taagaaaaaa ggtttaatta ttgtagggga 600
tatgcagcac caagaagttg atcaaatact aacgtattca acgatatatg atttgcctat 660
tttagctgat ctttaagtc atttaagaaa atttgatcat ccgaatgtta tctgtacata 720
tgatttgctg tttagaagcg gcttagactt aaatgtggat ttcgtaattc gtgttgggaa 780
accagtgatt tctaaaaagt tgaatcaatg gttaaagaaa actgatgcat ttcaaataat 840
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ttctgcgaat gatttcttta ggtcattaat ggaagacacg accatcaatc gcgtaagttg 960
gttagaaaaa tggcaacgct tagagaaaaa agggcgtaaa gaaattaaat gttatttgga 1020
acaagctaca gatgagagtg cattcggttg tgaattgatt aagaaaacat ctgaaaaaga 1080
tgcattatth attagtaata gtatgcctat cagagatgta gataacttgt tattgaataa 1140
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actgggtatg gctgtgcata aacgaataac attattgata ggtgatttat cattttatca 1260
tgatatgaat ggactattaa tgtcaaaatt aaataatatt cagatgaata ttgtattatt 1320
gaacaacgat ggtggcggta ttttttcata tttaccacaa aaagaaagtg caactgacta 1380
ttttgaacgg ttgtttggca caccgacggg attggatttc gagtatacag ctaa 1434

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<210> 34
<211> 1149
<212> DNA
<213> Staphylococcus aureus

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<400> 34
atggactttt ggttatataa acaagcacia caaaatggac atcatattgc gataacagac 60

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ggtcaagaat cttataactta tcaaaattta tactgtgaag cgagtctatt ggctaaaaga 120
 ctcaaggctt atcaacaatc tcgtgtcggg ctatacatag ataattcgat tcaatcgatc 180
 attttaatac atgcttggtg gttggcaaat attgaaattg cgatgattaa tacaagggtg 240
 acacctaatag agatgaagaa tcagatgagg tcaatcgatg tacaattgat tttttgtacc 300
 ttgccactgg aattgcgagg gtttcaaatt gtatcgctgg atgatattga attcgctgga 360
 acggatatta caatgaacgg tttgttgac aacacaatgg atatccaata tgatacatcg 420
 aatgaaactg tgggtgccga agagtcgccg tccaacatat taaatacttc atttaattta 480
 gatgacattg catcgattat gtttacatca gggacaactg gccctcaaaa agcggtgccg 540
 caaacgtttc gtaatcatta tgccagtga atcggatgta aagagagctt gggatttgat 600
 cgtgatacta attggctatc tgtcttgccg atttatcata tttcgggtct cagtgtactt 660
 ttaagagctg ttattgaagg gtttactgtg cgcattgttg ataaattcaa tgccgaacaa 720
 attttaacga taattaaaaa tgaacgcac acgcacattt cgcttgtgcc acaaacttta 780
 aattggctta tgcaacaagg ttacatgaa ccttataatt tgcaaaaaat attactcggc 840
 ggtgctaaat tatctgccac ttgatagag acggcattac aatataacct gccaatattat 900
 aattcatttg gtatgactga gacatgttca caatttttaa cagcaacacc ggaaatgttg 960
 catgcacgtc ctgacactgt agggatgcca agtgccaatg tagacgttaa aattaaaaat 1020
 cctaataaag aaggctatgg agaattaatg attaaagggtg ccaatgtgat gaatggatat 1080
 ttgtatccaa cagatttaac gggtagcttt gaaaatggtt attttaatac gggtagacatt 1140
 gctgaaata 1149

<210> 35
 <211> 236
 <212> DNA
 <213> Staphylococcus aureus

<400> 35
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 ttattgaac agaaagaatt tggtagacga ggattatatg gtgcgccggg tggctatata 120
 gatatatatg atgattgtga atttattggt gcaattcggt cgatgcttat taagaaagca 180
 caagcaactt tatttgctgg gtgtggcatt gttaaagatt ctgatccaga tagtga 236

<210> 36
 <211> 327

<212> DNA
<213> Staphylococcus aureus

<400> 36
atgagggtact ctttaattag tggatcttg ataggtttta ttgcgcctct aatcgggtgct 60
tttatcgttg ttagacgact atcacttata gctgatgctc taagtcattg aacttttaggt 120
gggtatactt tcgggatgtt ttacttact attatgcaa cactagtatt tattaatcca 180
atgtgggttg gaatcttatt cgcaatagta ggtgcgcttc taattgaaa attaagaacg 240
tcatacactg cttaccaaga aattgctatt ccaattataa tgagtgtggtg tatcgccttg 300
agtgcattct tcatttcatt agctgat 327

<210> 37
<211> 195
<212> DNA
<213> Staphylococcus aureus

<400> 37
gaaaatacag aacttgatgg tgaaatgaag tttagaatcg cttgtacaaa ccatcatcat 60
catcatttta tctgtgaaaa gtgtggagat acaaaggtta tagattattg tccaatagat 120
cagataaagt tatcactacc tgggtgttaat attcacaaac acaaacttga agtttatggt 180
gtatgtgagt cttgc 195

<210> 38
<211> 313
<212> DNA
<213> Staphylococcus aureus

<400> 38
acacagagaa taatcaagag aagacgtttt catctgaaga aagtaacagt aagccattta 60
tggtagaaaa tcaaacgat gaaatagtta taagagaaga ttcatataat ccattcgtaa 120
cgaaaacgtc tgaaagttaa atagctgatg atgaatcttc cggttataat aatacacgtg 180
aaaaagatga agactacttc aaaaagcaac aagaaattct acaagaaatg gatcaaacaat 240
ttgattcgaa tgacgatata tctgtgcaaa attatgagaa taaagcgtct gatgattatt 300
atgatgtaaa cga 313

<210> 39
<211> 322
<212> DNA
<213> Staphylococcus aureus

<400> 39
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 ttttaatttgt agttcaatct cgcttttcttg atcatttttca aacaaatcaa atgatgcttg 120
 ttcaaagtct ttttgagata aagtatcagt tgttttcttca acacttaagt ttaaattttc 180
 ttgattaatt tcaggttcat tttcgaccat ttttaaatat gatatcgatg attttttacc 240
 agcagacgct tcaaactcgc ttagaatcac ttgtgctctg ctaataactt tttcaggtaa 300
 atcagctaatt ttcgcaactt ga 322

<210> 40
 <211> 432
 <212> DNA
 <213> Staphylococcus aureus

<400> 40
 actcaaacag ttagcaagat tgctcaagtt aaaccaaaaca aactgggtat tcgtgcttct 60
 gtttatgaaa aaacagcgaa aaacgggtgcg aaatatgcag accgtacggt ctatgtaaca 120
 aaagagcgtg ctcatggtaa tgaaacgtat gtattattaa acaatacaag ccataacatc 180
 ccattagggtt ggttcaatgt aaaagactta aatgtttcaa acttaggcaa agaagttaa 240
 acgactcaaa aatatactgt taataaatca aataacggct tatcaatggt tccttgggggt 300
 actaaaaacc aagtcatttt aacaggcaat aacattgctc aagggtacatt taatgcaacg 360
 aaacaagtat ctgtaggcaa agatgtttat ttatacggta ctattaataa ccgcactggt 420
 tgggtaaatg ca 432

<210> 41
 <211> 353
 <212> DNA
 <213> Staphylococcus aureus

<400> 41
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 caacaggcaa cacgtattgc taaaaaatg tatgatgact tattaattgt tgcagacact 120
 tgtttatgtg aatatactga tcatgggtcat tgtggcgtga ttgatgacca tacacatgac 180
 gttgacaatg ataaatcatt gccactgctt gttaaaacag caatttctca agtggaaagct 240
 ggtgctgata ttattgcgcc aagtaatatg atggatgggt ttgttgctga aattcgctgt 300
 ggattagatg aagccggcta ttacaatatt cctataatga gttatgggtgt caa 353

<210> 42
<211> 399
<212> DNA
<213> *Staphylococcus aureus*

<400> 42
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taagaaaatt acagaacgtg ataagaaaga tttctggatt cagttgcatc ctaaaaaagc 120
aaaagcaatg atgacaaaag aacaagctat gttagcagat ggaagtatta aacaagatca 180
atatgataaa caactgttat cgaaaatcag aaaatcacia ttagatgaat tgtcttctaa 240
agatttacaa gtttttagcta tttttcgaga gatgaatgca ggaacagttt tagatccaca 300
aatgataaaa aatgaagatg tcagtgaaaa agagtatgca gcagtttctc agcaactttc 360
caaattacca ggtgttaaca cgtctatgga ttgggatag 399

<210> 43
<211> 329
<212> DNA
<213> *Staphylococcus aureus*

<220>
<221> misc_feature
<222> (56)..(56)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (71)..(71)
<223> n is a, c, g, or t

<400> 43
tgacatttca aatcaatcac atcggtgcaa atggttcaag aatcaaatg aaagcncgca 60
gaagaacttg naaaaagatg gttattctgt tgaagtaatt gacttacgta ctgttcaacc 120
aatcgatgtt gatacaattg tagcttcagt tgaaaaaact ggtcgtgcag ttgtagttca 180
agaagcacia cgtcaagctg gtgttggtgc agcagttgta gctgaattaa gtgaacgtgc 240
aatcctttca ttagaagcac ctattggaag agttgcagca gcagatacaa tttatccatt 300
cactcaagct gaaaatgttt gggtaccaa 329

<210> 44
<211> 303
<212> DNA
<213> *Staphylococcus aureus*

<400> 44
ctggagatac tattgaagaa gacgatgttt tagctgaggt acaaaacgat aaatcagtag 60
tagaaatccc atcaccagta tctggtactg tagaagaagt tatggtagaa gaaggtacag 120
tagctgtagt tgggtgacgtt attgttaaaa tcgatgcacc tgatgcagaa gatatgcaat 180
ttaaagggtca tgatgatgat tcatcatcta aagaagaacc tgcgaaagag gaagcgccag 240
cagagcaagc acctgtagct actcaaactg aagaagtaga tgaaaacaga actgtaaaag 300
caa 303

<210> 45
<211> 302
<212> DNA
<213> Staphylococcus aureus

<400> 45
tagttatcga gattatcaaa gattggtaga taaacttcaa gttcacgata aagagataga 60
cttagcttct agcttacaac aaacaatgct taaaacagat attccacaat ttgatagtat 120
tcaaattggc gttattttcag tggcggcaca aaaagtaagt ggagattatt ttaatttaat 180
tgaccataac gatggcacia tgagctttgc tgttgagat gtcattggaa aaggtatacc 240
agctgcttta gcaatgagta tgataaagtt tggcatggat tcttatggac actcacaatt 300
ac 302

<210> 46
<211> 254
<212> DNA
<213> Staphylococcus aureus

<400> 46
tgaatcttaa tatagaaaca accactcaag ataaatttta cgaagttaaa gtcggtggag 60
aattagatgt ttatactgtg cctgaattag aagaggtttt aacacctatg agacaagatg 120
gaactcgtga tatttatggt aatttagaaa atgtgagtta tatggattcg acaggtttag 180
gtttattcgt aggtacatta aaagcattaa accaaaatga taaagaacta tacatttttag 240
gtgtgtcaga tcgt 254

<210> 47
<211> 191
<212> DNA
<213> Staphylococcus aureus

<400> 47

tctaaagaag attttatcga aatgcgcgtg ccagcatcgg cagagtatgt aagtttaatt 60
cgtttaacac tttctggcgt tttttcgaga gctggtgcta catatgatga tattgaagat 120
gccaaagattg cagttagtga agctgtgaca aatgcagtta aacatgcata caaagaaaat 180
aacaatgtag g 191

<210> 48
<211> 204
<212> DNA
<213> Staphylococcus aureus

<400> 48
tgagatagat gcaatcatgt ttatggttaa tgccaatgag gaaattggac gaggtgatga 60
atatattata gaaatgttga aaaatgttaa gacaccagta ttttagtat taaataaaat 120
agatttagtg catccagatg aattaatgcc aaagattgaa gaatatcaaa gttatatgga 180
ctttacagag attgtaccta tttc 204

<210> 49
<211> 234
<212> DNA
<213> Staphylococcus aureus

<400> 49
aatataattg ggaagaagta catcaagaag cagaaatfff agaacatcga atttcagatt 60
tatttggtga aaggctggat agcctgttaa atttccaga aacttgcccg cacggcggtg 120
tgattcctag aaataatgaa tataaagaga aatatataac aacgattttg aattatgaac 180
ctggtgatat cgttacaatc aaacgtgtga gagataagac cgatttgcta atat 234

<210> 50
<211> 251
<212> DNA
<213> Staphylococcus aureus

<400> 50
ttgaattacc aaaattacca tacgcatttg atgcattaga accacatttt gacaaagaaa 60
ctatggaaat tcatcatgac agacatcata acacttatgt tacgaaatta aatgctgcag 120
tagaaggtag agatttagaa tctaaatcta ttgaagaaat tgttgctaatt ttagacagtg 180
taccagctaa catccaaact gctgtacgta ataatggcgg tggacattta aaccattcat 240
tattctggga g 251

<210> 51
 <211> 359
 <212> DNA
 <213> Staphylococcus aureus

<400> 51
 gcgcattttg aaaaggcata cttgagaata ctaaagtgtc tgttacaatt aaagaacctc 60
 ctgttgctaa ttttttcatt gtcttgtccc cttatattac aatttgatta catttacatt 120
 atcatagcat tacaaaagaa atgcaacaaa atttttgaat cattacattt ttttataaaa 180
 atttcacttt agattcacao taattactta ttttgtcaat ttatttaatg tcaatatgtt 240
 gattaattaa tagtggtgtc taatgtatat aatatttagg tcatcgttat agtcaacaat 300
 aataagggtat ttcgagttga aatttatctt attatttttc cacttttacg tgctatccc 359

<210> 52
 <211> 438
 <212> DNA
 <213> Staphylococcus aureus

<400> 52
 ttcgttggtc ataggtgcga gtgaactatc aattaaagat ttactacatt taactgagtc 60
 acagcggaaat attttattct caagccgaat accaaggacg atgagtattt taattgctgg 120
 aagttcgttg gctttagcag gcttgataat gcaacaaatg atgcaaaata agtttggttag 180
 tccgactaca gctggaacga tggaatgggc taaactaggt attttaattg ctttattggt 240
 ctttccaacc ggtcatattt tattaaaact agtatttgcg gttatttgta gtatttgcg 300
 tacgttttta tttgttaaaa tcattgattt tataaaagtg aaagatgtca tttttgtacc 360
 gcttctagga attatgatgg gtgggattgt tgcaagtttc acaaccttca tctcattgag 420
 cacgagtgcg gttcaaag 438

<210> 53
 <211> 288
 <212> DNA
 <213> Staphylococcus aureus

<400> 53
 tattgcctta tttagatgta ttgcttttag gtcgtgctga agcaattaat ctggggatat 60
 cgtatgaaaa attaacgcga attctacttg taatagtctc agtttttagt tctgtgtcaa 120
 ctgcattagt aggaccaatt acatttttag gtttattaac tgtaaatcta gcgcattgac 180
 taatgaagac gtatgaacat aagtatattt taattgcgac aatttgcttg agttggatta 240

gtttatttag tgcgcaatgg gtagttgaaa atgtgtttga agctacga 288

<210> 54
<211> 431
<212> DNA
<213> Staphylococcus aureus

<400> 54
aatcaaatga tattggaaga tattagcata gatatcgaaa aaggtaaatt gacttcttta 60
attggaccta atgggtcggg taagagtact ttactttcag cgatttgtag gttaattcgt 120
tttgataacg gtgaagtga aatagatgga cggctcatgt ctgattataa aaataatgac 180
ttgtcgaaaa aaatatctat attaaaacaa acaaacata ctgaaatgaa tattacggta 240
gagcagittg taaactgtgg acgattccct tattctaaag gtcgtttgac gaaagaggat 300
catgatattg tcaatgatgc gctagatttg ttgcaactac aagatatcag aaatcgtaat 360
attaagtcac tatctggtgg acaacgtcag cgtgcatata ttgcaatgac aatagcacia 420
gatactgaat a 431

<210> 55
<211> 437
<212> DNA
<213> Staphylococcus aureus

<400> 55
catgcggtaa caattctgat aaagaacaat caaaatcaga gactaaaggt tctaaagata 60
cagtgaaaat tgaaaaataac tataaaatgc gtggcgagaa aaaagatggg agtgacgcta 120
aaaaagttaa agaaactgtt gaagtaccaa aaatcctga aaatgcagtt gtgttagact 180
atggcgcatc agatgtaatg aaagaaatgg gcttatcaga caaagtaaaa gcattaccta 240
aaggggaagg cggtaaagtca ttaccgaatt tcttagaatc atttaaagat gataaatata 300
caaacgttgg taattttaaaa gaagtgaatt ttgataaaat tgctgcgacg aaacccgaag 360
taatctttat ctctggacgt acagctaatac aaaagaattt agatgaattc aaaaaagctg 420
cacctaaagc gaaaatt 437

<210> 56
<211> 163
<212> DNA
<213> Staphylococcus aureus

<400> 56
gctgactatg aaggtaaagc tgacatttta aaattagatg ttgatgaaaa tccatcaact 60

gcagctaaat atgaagtgat gagtattcca acattaatcg tcttttaaaga cgggtcaacca 120
gttgataaag ttgttggttt ccaacccaaa gaaaacttag ctg 163

<210> 57
<211> 471
<212> DNA
<213> Staphylococcus aureus

<400> 57
caattggcctt tgcattattg ttgtatctat ttcgatatta ttaattgcaa tagtaatggc 60
atattatttt aaaaaaattg cacgtattaa tacagaaaaca gctattttta gtgttatacc 120
aggagcacta acacaaatgc tggatcatggc tgaacaagac aaacgtgcta atttgttagt 180
tgtagctta acgcaaacat cacgaattat atttgttggt gttttagtac cgttcatttc 240
atattttttt catgatggta acatgcatgc gaatggaaag ttaacaaaag tcttgccttt 300
atcacaagta ttaaacatag ggcaaatagt tatttttagcg atagctatct ttatagttta 360
tctaattatg tctaaaataa agtttccaac atttcaatta ttagcaccac tcattgtatt 420
aattgtttgg aatttttcta caggtttaac atttacta gatcattggg t 471

<210> 58
<211> 713
<212> DNA
<213> Staphylococcus aureus

<400> 58
cttagatgtc ccatgctgat ataacaattc aatcgcttta tctggatggt tttcaagatg 60
atatttatca atgattaaag ctagtgctcc cgaaacttta ggtgtggcta atgaagtcc 120
agcttgataa atatatcttc cgttattggc agtagttaaa atgttctcct tatgcatata 180
cccttcattc atccatttat ccacaccgaa ttgatttaaa taagcaaatg atcctccggg 240
cgcagcaata tctgtataat tcataccaaa attggaaaac tcagatagat tactcttttg 300
atctgtagat cctactgtaa cgacattgtc catagatgca ggaacatctt tcacttcgcc 360
attaccttga tattcacgct gtaatttttag tttctgtttg tcattgacat caataccatc 420
attaccagct gcagcaacaa cgatagattt tttcttcttg gcgtaattga ttgctttctg 480
taacgcatcg tattctactt tttcatcttt tctaaatggt tgatgggcat ttttgtccaa 540
aataatataa ctaccaacac taatattaat gacttgattt ccatcatttg cagcttgaac 600
aatcgctttt gataccctaa gcagttctgt ttttttacta ccaaaccgc gatacattgt 660

aaatttggtta ttcggtgcaa cacctattaa cttaccatta gcactcgttt gac 713

<210> 59
 <211> 738
 <212> DNA
 <213> Staphylococcus aureus

<400> 59
 ttcaataggc gtggtgtcag tgtagcggc tacaatgttt gttgtgtcat cacatgaagc 60
 acaagcctcg gaaaaaacat caactaatgc agcggcacia aaagaaacac taaatcaacc 120
 gggagaacaa gggaatgcga taacgtcaca tcaaatgcag tcaggaaagc aattagacga 180
 tatgcataaa gagaatggta aaagtggaa agtgacagaa ggtaaagata cgcttcaatc 240
 atcgaagcat caatcaacac aaaatagtaa aacaatcaga acgcaaatg ataatcaagt 300
 aaagcaagat tctgaacgac aaggttctaa acagtcacac caaaataatg cgactaataa 360
 tactgaacgt caaaatgatc aggttcaaaa taccatcat gctgaacgta atggatcaca 420
 atcgacaacg tcacaatcga atgatgttga taaatcacia ccatccattc cggcacaaaa 480
 ggtaataccc aatcatgata aagcagcacc aacttcaact acacccccgt ctaatgataa 540
 aactgcacct aaatcaacia aagcacaaga tgcaaccacg gacaaacatc caaatcaaca 600
 agatacacat caacctgcgc atcaaatcat agatgcaaag caagatgata ctgttcgcca 660
 aagtgaacag aaaccacaag ttggcgatth aagtaaacad atcgatggtc aaaattcccc 720
 agagaaaccg acagataa 738

<210> 60
 <211> 780
 <212> DNA
 <213> Staphylococcus aureus

<400> 60
 aggtcgtat gattgaaaaa attgcagagc tcgttcgtga caagaaaatt gacggtatca 60
 ctgatttacg tgatgaaaca agtttacgta ctggtgtgag tgctgttatt gatgtgcgta 120
 aggatgcaaa tgctagtgtc attttaataa acttatacaa acaaacacct cttcaaacat 180
 catttggtgt gaatatgatt gcacttgtaa atggtagacc gaagcttatt aatttaaaag 240
 aagcgttggt acattattta gagcatcaaa agacagttgt tagaagacgt acgcaatata 300
 acttacgtaa agctaaagat cgtgccata ttttagaagg gttacgtatc gcacttgacc 360
 atatcgatga aattatttca acgattcgtg agtcagatac agataaagtt gcaatggaaa 420

gcttgcaaca acgcttcaaa ctttctgaaa aacaagctca agctatttta gacatgcgtt 480
 taagacgtct aacaggttta gagagaaaca aaattgaagc tgaatataat gagttattaa 540
 attatattag tgaattagaa gccatcttag ctgatgaaga agtggtatta cagttagtta 600
 gagatgaatt gactgaaatt agagatcggt tcggtgatga gcgtcgtaca gaaattcaat 660
 taggtggatt tgaagactta gaggacgaag acttaattcc agaagaaca atagtaatta 720
 ctttgagcca taataactac attaaacggt tgccggtatc tacatatcgt gctcaaaacc 780

<210> 61
 <211> 622
 <212> DNA
 <213> Staphylococcus aureus

<400> 61
 ttggcacaac tgataagaca ggtactgtca ttcgttttaa agcagatgga gaaatcttca 60
 cagagacaac tgtatacaac tatgaaacat tacagcaacg tattagagag cttgctttct 120
 taaacaaagg aattcaaac acattaagag atgaacgtga tgaagaaaac gttagagaag 180
 actcctatca ctatgagggc ggtattaaat cttatgttga gttattgaac gaaaataaag 240
 aacctattca tgatgagcca atttatattc atcaatctaa agatgatatt gaagtagaaa 300
 ttgcgattca atataactca ggatatgcca caaatctttt aacttacgca aataacattc 360
 atacgtacga aggtggtacg catgaagacg gatttaaacy tgcattaacy cgtgtcttaa 420
 atagttatgg tttaagtagc aagattatga aagaagaaaa agatagactt tctggtgaag 480
 atacacgtga aggtatgaca gcaattatat ctatcaaaca tggatgcct caattcgaag 540
 gtcaaacgaa gacaaaatta ggtaattctg aagtgcgtca agttgtagat aaattattct 600
 cagagcactt tgaacgattt tt 622

<210> 62
 <211> 756
 <212> DNA
 <213> Staphylococcus aureus

<400> 62
 atcatcagcg acaatgagag atatggtag agagaatcat gtaagaaaag aagatttaat 60
 atatccaatt tttgtagttg aaaaagacga tgtgaaaaaa gaaattaagt cattgccagg 120
 tgtataccaa atcagtttga atttacttga aagtgaatta aaagaagctt atgacttagg 180
 catacgtgcc attatgtttt tcggtgttcc aaactcaaaa gatgatatag gtactggtgc 240

atacattcac gatggtgtta ttcaacaggc aacacgtatt gctaaaaaaaa tgtatgatga 300
 cttattaatt gttgcagaca cttgtttatg tgaatatact gatcatggtc attgtggcgt 360
 gattgatgac catacacatg acgttgacaa tgataaatca ttgccactac ttgttaaaac 420
 agcaatttct caagtggaag ctggtgctga tattattgcg ccaagtaata tgatggatgg 480
 ttttgttgct gaaattcgtc gtggattaga tgaagccggc tattacaata ttcctataat 540
 gagttatggg gtcaagtatg catcaagttt ctttggacct tttagagatg cagcagattc 600
 agcgccatca tttggggata gaaaaacgta tcagatggac cctgctaacc gtttggaaac 660
 acttcgtgaa ttagaaagtg atcttaaaga aggggtgcgc atgatgattg ttaaacctgc 720
 tctaagttat ttagatatag ttcgagatgt taaaaa 756

<210> 63
 <211> 200
 <212> DNA
 <213> Staphylococcus aureus

<400> 63
 gtgccaatg caggatatgc tacaatctca gatcaaacg aaatcgaatt tacaggttta 60
 attatgaccc cagatggtaa agaacgattt gaatatacaa tgaacggaac agatccggtt 120
 gagttaggca aaacagtga taacaaatta aaagagcaag gtgcttatga aattataaaa 180
 cgcttaaatg aacaacatta 200

<210> 64
 <211> 452
 <212> DNA
 <213> Staphylococcus aureus

<400> 64
 ttgataacat tgctgtgata ggaagtaaga cagcgcaata ttgtgaatca cttggcattc 60
 gagttgattt tatgccaaac gacttttctc aagaaggatt tttaaaatca tttaatcaaa 120
 ctaacaaaa aatacttttg ccttcgagtg aattggcgag accattgtta ttagcagcgt 180
 tatctaaaga taatgaagtt gttaaaatag atttatatac ttcagtgcct aacaaacaaa 240
 atatacaaga tgtaaagaa atgatagaac atcaacaaat cgatgcatta acattttcaa 300
 gttcgtcggc agtacgttat tattttaatg aaggatttgt accaaaattc aagtcgtatt 360
 ttgctatttg agaacaaca gcacggacca ttaaatcata tcaacaacca gtaacaattg 420
 cagaaattca aacactcgaa tcactaattg aa 452

<210> 65
<211> 757
<212> DNA
<213> *Staphylococcus aureus*

<400> 65
tcttccattc tctcagtcaa agaagggttta ttgatacta aaattgcttt actttcttta 60
tttatagctt tgatataatg attcactgga ttgatattcg tataacgcac accatctaca 120
taaccacttg cacctgctcc aaatccataa tattcctcat taaaccagta aaccttatta 180
tgttctgatt catggccatc taatgcaaaa ttagatatatt cgtattgatg gaaaggagat 240
tgttctatct tagacatcaa caactgatac atgtcagcac ctaaatcctc attaggaagt 300
ttaagcaacc cttttctata catattataa aattggggtt taggttcaag tattaagccg 360
taactcgaaa tatgttgaat atccatatct aaagctagat ctaaactttg ttcaaaatct 420
tcaatcgtct gtttcggtaa atgatacatt aaatctaaac tgattgattt aatacctgcg 480
tttttagcat ttaacaccga agtgtaaata tcttcagtat tgtgcgttct acctaaaaca 540
gacaataact ccggtttgaa tgtttgaacg ccattgaaa ttctatttac tccatatctc 600
tctaatagtt ggactttctc tttagttaac tcatcaggat ttgcttcaaa tgtatactcg 660
cctgtgattg taaacgtatc acgtattgct ttaagtaatc tttccaactg attaatagaa 720
agggccgttg gtgtgccgcc acctacatac atggtct 757

<210> 66
<211> 464
<212> DNA
<213> *Staphylococcus aureus*

<400> 66
agggcaaatg ctttcagtaa ctataaatag tggcattata aaatttagtg aattggatag 60
aaaagataat tcaagtaaag ataaaaagta ttataaagta gttaggaaaa atgatattgc 120
atataattct atgagaatgt ggcaaggggc tagtggtaaa tcaaattata atgggattgt 180
tagccctgca tatactgtgc tttatccaac acaaaatact agctcattat ttattggata 240
taagtttaaa acacatagaa tgattcataa atttaaaatt aattcacaag gattaacatc 300
agatacatgg aacttaaaat ataaacaatt aaaaaatata aatatagata tacctgtatt 360
ggaggaacaa gaaaagatag gtgatttctt taaaaaatg gatataattga taagtaaaca 420
gaaatgaaa attgaaatat tagaaaaaga gaaacaatcc tttt 464

<210> 67
 <211> 533
 <212> DNA
 <213> *Staphylococcus aureus*

<400> 67
 gtgccagagt tgagattccc agggtttgaa ggcgaatggg aagagaagca gttgggggat 60
 cttacagata gagtaattag gaaaaataaa aacttagaat cgaaaaagcc tttacaata 120
 tccggacagt taggtttaat tgatcaaaca gaatatTTTA gtaaatcagt ttcgtcgaaa 180
 aatctagaaa attatacact aataaagaat ggagaattcg cgtataacaa aagttattct 240
 aatggatacc cattaggggc tattaaaaga ttaactagat atgatagtgg tgtattgtcc 300
 tctttgtata tttgtttttc tattaaaagt gaaatgtcta aagacttcat ggaagcatat 360
 tttgattcga cacttggtg tagagaagtt tctggaattg cagttgaggg tgcaagaaat 420
 cacggattat taaatgtttc tgtgaatgat ttttttacta ttctaattaa atatccaagt 480
 ttagaagaac agcaaaaaat aggcaagttc ttcagcaaac tcgaccgaca aat 533

<210> 68
 <211> 721
 <212> DNA
 <213> *Staphylococcus aureus*

<400> 68
 tgcattctcc attttaatag ctacattact atttttaagt ggtggacaag cacaagcagc 60
 tgagaagcaa gtgaatatgg gaaattcaca ggaggataca gttacagcac aatctattgg 120
 ggatcaacaa actagggaaa atgctaatta tcaacgtgaa aacggtgttg acgaacagca 180
 acatactgaa aatttaacta agaacttgca taatgataaa acaatatcag aagaaaatca 240
 tcgtaaaaaca gatgatttga ataaagatca actaaaggat gataaaaaag catcgcttaa 300
 taataaaaat attcaacgtg atacaacaaa aaataacaat gctaattccta gcgatgtaaa 360
 tcaagggtta gaacaggcta ttaatgatgg taaacaaagt aaagtggcgt cacagcaaca 420
 gtcaaaagag gcagataata gtcaagattc aaacgctaat aacaatctac cttcacaag 480
 tcgaataaag gaagcaccat cattaaataa gttagatcaa acaagtcaac gagaaattgt 540
 taatgagaca gaaatagaga aagtacaacc acaacaaaat aatcaagcga atgataaaat 600
 tactaactac aattttaaca atgaacaaga agtgaaacct caaaaagacg aaaaaacact 660
 atcagtttca gatttaaaaa acaatcaaaa atcaccagta gaaccaacaa aggacaatga 720

c

721

<210> 69
 <211> 416
 <212> DNA
 <213> Staphylococcus aureus

<400> 69
 ttgacagctt tgcattttta taaatatagt gagccattta agtcacaaat tgtaacaccg 60
 aaagtcactt taacgcatcg tgattgtttg tttatcgaat tgattgatga caaaggaaat 120
 gcatattttcg gggaatgtaa cgcttttcaa acagattggg atgatcatga aacaattgcc 180
 tcagtgaaac atgtaattga gcaatgggtc gaagataata gaaataaatc atttgaaacg 240
 tatgaagcag cactaaaatt agtagattca ttggaaaata cgctgctgc aagggcaact 300
 attgtcatgg cattgtatca aatgtttcat gtactgcctt cattttcagt agcatatgga 360
 gcgacagcga gcggcttata aaataaacia ctagagtcac taaaagcaac aaagcc 416

<210> 70
 <211> 400
 <212> DNA
 <213> Staphylococcus aureus

<400> 70
 gtattattgc ttgggggtgat gatgaacatc tacgtaaaat tgaagcagat gttccaattt 60
 attattatgg atttaaagat tcggatgaca tttatgctca aaatattcaa attacggata 120
 aagggtactgc ttttgatgtg tatgtggatg gtgagtttta tgatcacttc ctgtctccac 180
 aatatgggtga ccatacagtt ttaaatgcat tagctgtaat tgcgattagt tatttagaga 240
 agctagatgt taaaaatatt aaagaagcat tagaaacggt tgggtggtgtt aaacgtcggt 300
 tcaatgaaac tacaattgca aatcaagtta ttgtagatga ttatgcacac catccaagag 360
 aaattagtgct tacaattgaa acagcacgaa agaaatatcc 400

<210> 71
 <211> 613
 <212> DNA
 <213> Staphylococcus aureus

<400> 71
 tggctatcag taatgtttcg aaagggaat acgcaaagag gtttttcttt ttcgtacta 60
 gttgcttagt gttaacttta gttgtagttt caagtctaag tagctcagca aatgcatcac 120

aaacagataa cggcgtaaat agaagtgggt ctgaagatcc aacagtatat agtgcaactt 180
 caactaaaaa attacataaa gaacctgcga ctttaattaa agcgattgat ggtgatacgg 240
 ttaaattaat gtacaaaggt caaccaatga cattcagact attattgggt gatacacctg 300
 aaacaaagca tcctaaaaaa ggtgtagaga aatatgggtcc tgaagcaagt gcatttacga 360
 aaaaaatgggt agaaaatgca aagaaaattg aagtcgagtt tgacaaaggt caaagaactg 420
 ataaatatgg acgtggctta gcgtatatatt atgctgatgg aaaaatggta aacgaagctt 480
 tagttcgtca aggcttggct aaagttgctt atgtttacaa acctaacaat acacatgaac 540
 aacatttaag aaaaagtga gacaagcga aaaaagagaa attaaatatt tggagcgaag 600
 acaacgctga ttc 613

<210> 72
 <211> 212
 <212> DNA
 <213> Staphylococcus aureus

<400> 72
 atggccaagc tgctgaagtt gattacattg gtatgccagc agtatgcttt actgaacctg 60
 aattagctac agttggttat tcagaagcgc aagctaaaga agaaggttta gcaattaaag 120
 cttctaaatt tccatatgca gcaaatggtc gtgcattatc attagacgat actaacggat 180
 ttgttaaact tattacactt aaagaagatg at 212

<210> 73
 <211> 763
 <212> DNA
 <213> Staphylococcus aureus

<400> 73
 tggaagacat cgtaaacgta gaaactacgc gagaatttca gaagtattag aattaccaaa 60
 cttaatagaa attcaaacta aatcttacga gtggttccta agagaagggt taatcgaaat 120
 gtttagagac atttctccaa ttgaagattt tactggtaat ttgtcattag agtttgtgga 180
 ttaccgttta ggagaaccaa aatatgattt agaagaatct aaaaaccgtg acgctactta 240
 tgctgcacct cttcgtgtaa aagtgcgtct aatcattaaa gaaacaggag aagttaaaga 300
 acaagaagtc tttatgggtg atttccatt aatgactgat acaggtacgt tcgttatcaa 360
 tgggtcagaa cgtgtaatcg tatctcaatt agttcgttca ccatccgttt atttcaatga 420
 aaaaatcgac aaaaatggtc gtgaaaacta tgatgcaaca attattccaa accgtgggtgc 480

atgggttagaa tatgaaacag atgctaaaga tggtgtatac gtacgtattg atagaacacg 540
 taaactacca ttaacagtat tggtacgtgc attaggtttc tcaagcgacc aagaaattgt 600
 tgacctttta ggtgacaatg aatattttacg taatacttta gagaaagacg gcactgaaaa 660
 cactgaacaa gcgttattag aaatctatga acgtttacgt ccaggtgaac caccaactgt 720
 tgaaaaatgct aaaagtctat tgtattcacg tttctttgat cca 763

<210> 74
 <211> 500
 <212> DNA
 <213> Staphylococcus aureus

<400> 74
 ggcagttgta ctccacatg gtgtcttatt ccgtggtgcc gcagaaggcg tcattcgctg 60
 ttatttaatt gaagaaaaga actacttaga agccgtgatt ggcttaccag tgaatatttt 120
 ctatgggaca agtattccaa catgtatctt agtatttaaa aaatggtgcc aacaagacga 180
 caacgtatta tttatcgatg catccaatga ttttgaaaaa ggaaaaaatc aaaaccattt 240
 aagcgatgcc caagtcgaac gtattattga cacatacaag cgtaaagaaa caattgataa 300
 atacagttac agtgcgacat tacaagagat tgccgataac gattacaacc taaacatacc 360
 gaggtatgtc gatacattcg aagaagaagc gccaatgat ttagatcaag tccaacaaga 420
 tttgaaaaat atcgacaaag aaatcgaga aattgaacaa gaaatcaatg catacctgaa 480
 agaacttggg gtgttgaaag 500

<210> 75
 <211> 468
 <212> DNA
 <213> Staphylococcus aureus

<400> 75
 tgaatagaaa tactaggacc acaaccggtt atttttcaat agaagaaata gattcaagaa 60
 aaagccttga tgaaagagaa acagaaaaaa agtatcctgt gaaaatgata aacaataaaa 120
 ttattccaac tgaggagata aaagatgaaa agttgaaaaa ggaaattgaa aactttaagt 180
 tttttgtgca atatggcagt tttaaaggaa tagagaatta tgaaaatggg gacatttcct 240
 ataattctga agctcctatt tattcagcga aatataaact gaaaaatgat gattataatg 300
 ttaaagaatt acgaaaaaga tataatatc caacagaaaa ggcgccataa ttgttggtga 360
 aagggttcggg ggatttgaaa gggcttcag ttggatataa ggaaattgaa tttatattta 420

tagaaaataa aaaagaaaat atatattttt cagatggatt aaacttaa 468

<210> 76
<211> 512
<212> DNA
<213> Staphylococcus aureus

<400> 76
ggtgtattag ataataagg tatggtttta aatttggata gaaatacacg aacggccaag 60
ggatattatt ttgtagatac tatatatgac aatcatgaaa actcttatag taaaaattat 120
agagttgaga tgaaaaacaa taaaattatt ttattagaca aggtggaaga tcaaaaactt 180
aaagaaagaa tagaaaactt taaatttttc ggacaatatg ccgatttcaa gagtttgaaa 240
agttacaacc atggcgacgt ttcaattaat agtaatgttc caagttatga cgcgaaattt 300
aaaatgagta ataaagatga aaatgttaag caattaagaa gccgttataa cattcctact 360
gataaagctc caatattaaa aatgcatatt gatggggact taaaaggcag ttccgttgga 420
tataaaaagt tagaaataga cttttcaaaa gaagaaaata gcgaattatc aatagtcgat 480
tcattaaatt ttcaacctgc caaaaataaa ga 512

<210> 77
<211> 502
<212> DNA
<213> Staphylococcus aureus

<400> 77
aaccaaaagg cgagagttta aaatcacgag gaatgatatt aaagttagat agaaataaga 60
gaactgctaa aggaagtatt attattagag aattgaaaga agataaaaat catgatgttc 120
aaaaaaatga aaagaaatat ccagtgaat tggtgaataa taggatagtt ttggtaaaag 180
atgttaaaga caaaaagtta aaaaatgaaa tagagtcggt tgaattatct tcacaatatg 240
gaaactttta tcatcttgat cggaatgaga ttactaatat tcatataat cctaattgctc 300
ccaattactc tgcagaatat aaaatgaaga aaaatgacag aaacattcaa cagttgaaaa 360
agagatttaa tctaaaaact agcaagacac caaaattatt gtttaaggga tctggagata 420
taaaggggtc ttctgtagga tataaggaaa tagaaatcat atttagtaga agtaaagaag 480
aagcatttat tatgttgaca gc 502

<210> 78
<211> 400
<212> DNA

<213> Staphylococcus aureus

<400> 78

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gcgaaaagagt cgaaatcagc taatgaaatt tcacctgagc aaattaacca atggattaaa      60
gaacaccaag aaaataagaa tacagatgca caggataagt tagttaaaca ttaccaaaaa      120
ctaattgagt cattggcata taaatattct aaaggacaat cacatcacga agatttagtt      180
caagttggta tggttggttt aataggtgcc ataaatagat tcgatatgtc ctttgaacgg      240
aagtttgaag cttttttagt acctactgta atcggtgaaa tcaaaagata tctacgagat      300
aaaacttggg gtgtacatgt tccgagacgt attaaagaaa ttgggccaag aatcaaaaaa      360
gtgagcgatg aactaaccgc tgaattagag cgttcacctt      400
```

<210> 79

<211> 529

<212> DNA

<213> Staphylococcus aureus

<400> 79

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ccgttacggt gttcttcagt taagttaggt aaatgtaaaa ttcatagaa agcattttgt      60
tgttctttgt tgaatttggt gtcagctttt ggtgcttggt catcatttag ctttttagct      120
tctgctaaaa ggtagcgt ttggcttggg tcatctttta agctttggat gaaaccattg      180
cgttgttctt cgtttaagtt aggtaaatgt aagatttcat agaaagcatt ttgttgttct      240
ttgttgaatt tggtatccgc tttcggtgct tgagattcat ttaacttttt agcttctgac      300
aataggttag cactttgact tgggtcatct tttaagcttt ggatgaaacc attgcgttgt      360
tcttcgttca agttaggcat gttcaagatt tcatagaaag cattttgttg ttctttgttg      420
aaattgttgt cagctttcgg tgcttgagat tcgtttaatt ttttagcttc acctaaaacg      480
ttagtgcttt ggcttgatc gtctttaaga ctttgaatga aaccattgc      529
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<210> 80

<211> 528

<212> DNA

<213> Staphylococcus aureus

<400> 80

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tgatattgga agatattagc atagatatcg aaaaaggtaa attgacttct ttaattggac      60
ctaattggtgc gggtaagagt actttacttt cagcgatttg taggttaatt cgttttgata      120
acggtgaagt gaaaatagat ggacggctca tgtctgatta taaaaataat gacttgtcga      180
aaaaaatatc tatattaaaa caaacaacc atactgaaat gaatattacg gtagagcagt      240
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tggtaaaactg tggacgattc ccttattcta aaggctcgttt gacgaaagag gatcatgata 300
 ttgtcaatga tgcgctagat ttgttgcaac tacaagatat cagaaatcgt aatattaagt 360
 cattatctgg tggacaacgt cagcgtgcat atattgcaat gacaatagca caagatactg 420
 aatatatttt gctagatgaa ccattaaata atttagatat gaagcatgct gttcaaatta 480
 tgcaaacggt aaaaatgtta gcgcataaaa tgaataaagc gattgtca 528

<210> 81
 <211> 513
 <212> DNA
 <213> Staphylococcus aureus

<400> 81
 ttttgattta tcttctgacg gtttaaaata accattcttt accattctt cataacgtcc 60
 cgcttcaact tcacgaggat catatcttgg ttctatttcc atttgctata cctcctaaaa 120
 aaataaaaat atccatccta tatacaaata ggacggatat tccgtggtac cacctatatt 180
 caagaaggat gattaatatc aaattcactc ttttaacata attggaataa tcataccaat 240
 actatcatcg tgaaatttga aatgcttcat ctcttcaagc actctagatt atgattaacg 300
 ctcaaacacg tcttagccta ctattaatca cgttcagcta agatactctg tgggctacct 360
 tcagtaagaa aatcatttac atactcacac caaatcatat gctctcttta aaataatttg 420
 aacttactct tcccaaatcc tatattaaac tcttaactta tagtataatg attgacaaaa 480
 taagtcaatg tatagggtgg aataaaatga atg 513

<210> 82
 <211> 361
 <212> DNA
 <213> Staphylococcus aureus

<400> 82
 tggatataac aatcaaaaatc actcaatgct tgcataccgc gttctcggtc agtagggttt 60
 ttgaaactaa tttttaagc accgtatata tcttcgcgta cttctaagat tcttaagttg 120
 cttatagata tgttatgtaa actcaggata taagtcactt tacttatcat acctgattca 180
 tccggaatgt ctacatatag atcatacgca gtatttagtc cacctagttg tttagcgggt 240
 agtgcgtcgc gatagatgtt agcttgggca aaaaatgata acaatttttc agaatacattg 300
 ctttcaatta gtctttctaa atcttgaaac tgacttttta gctgtcgaat catttctaaa 360
 a 361

<210> 83
<211> 731
<212> DNA
<213> *Staphylococcus aureus*

<400> 83
atgagatacc taacatcagg agaatcacat ggacctcaat taacagttat tgttgaaggt 60
gtacctgcaa atttagaagt taaggttgag gatattaata aagaaatggt taagcgtcaa 120
ggcggttacg gacgtggacg tcgtatgcaa attgaaaaag atacagtgga gattgtttcg 180
gggtgaagaa atggttatac attaggtagc cctattacaa tgggtgttac taatgatgat 240
tttacacatt ggcgaaaaat tatgggccgt gcgccaataa gcgacgaaga acgagaaaat 300
atgaaacgta caattacgaa gccaaagaccg ggacatgcag atttacttgg cggtatgaaa 360
tataatcatc gtgacttacg aaatgtatta gaacgttcat ctgccagaga aacagcagca 420
cgtgtagcgg tcggtgcact atgcaaagtt ttattagaac aattagatat cgaaatatac 480
agtcgtgttg ttgagatagg tggcattaaa gataaagatt tttatgattc agaaacattt 540
aaagcaaacc ttgatcgaaa tgacgtccgt gtaattgatg atggcatcgc acaagcaatg 600
cgcgataaaa ttgatgaagc gaaaacagat ggtgattcaa tagggggcgt agttcaagtt 660
gtagttgaaa atatgcctgt tgggtgtaggt agttatgtac attatgatcg taaattagat 720
ggaagaatag c 731

<210> 84
<211> 254
<212> DNA
<213> *Staphylococcus aureus*

<400> 84
accttcaata ttgcgatcca taagtttcaa tggctcgaag acacgatcca ttggcctttt 60
accaattgaa acatcgccag acaaaacact ttcaatacct aaaccactta acaaaccagc 120
taacaatcga gtcgttgtgc cagagtttcc agtatataaa acttgatgag gtgtttttaa 180
agctttatat ccaggatgaat tcacaaccaa tttatottca tcttctttaa tatctacgcc 240
taataatcgg aata 254

<210> 85
<211> 716
<212> DNA
<213> *Staphylococcus aureus*

<400> 85
 tcgaggaatt aacaaaggtc aaaggttata caacacatgt ggataacaat gatatgggca 60
 acttgattgt gacgaataaa tatacgccag aaacaacatc aattagtggg gaaaaagtat 120
 gggacgacaa agacaatcaa gatggtaaga gaccagaaaa agtcagtgtg aatttattgg 180
 ctaacggaga gaaagtaaaa acgttagacg tgacatctga acaaaactgg aagtacgaat 240
 ttaaagactt accgaagtat gatgaaggaa agaaaataga atatacagt accgaagatc 300
 acgtaaaaga ctacacaaca gacatcaacg gtacgacaat aacgaacaag tatacaccag 360
 gagagacatc ggcaacagta acaaaaaatt gggatgacaa taataaccaa gacggaaaac 420
 gaccaactga aatcaaagtt gagttatatc aagatggaaa agcaacagga aaaacggcaa 480
 tattaaatga atctaataac tggacacata cgtggacagg attagatgaa aaagcaaaag 540
 gacaacaagt aaaatacaca gtcgatgaat taacaaaagt taatggctat acaacgcatg 600
 tggataacaa tgatatgggt aacttgattg tgacaaataa atatacgccg aaaaaaccga 660
 ataaaccaat ctatcctgaa aaaccaaaag acaaaacacc accaactaaa cctgat 716

<210> 86
 <211> 581
 <212> DNA
 <213> Staphylococcus aureus

<400> 86
 gaacctagcc atcaagacag tacacctcaa catgaagagg aatattataa taagaatgct 60
 tttgcaatgg ataaatcaca tccagaacca atcgaagaca atgataaaca cgatactatt 120
 aaaaatgcag aaaataaacac tgagcattca acagtctctg ataagagtga agctgaacaa 180
 tctcagcaac ctaaaccata ttttacaaca ggtgctaacc aatcagaaac atcaaaaaat 240
 gaacatgata atgattctgt aaaacaagat caagatgaac ctaaagaaca tcataatggg 300
 aaaaaagcag cagctattgg tgctggaaca gcaggtgttg caggtgcagc tggtgcaatg 360
 gctgcttcta aagctaagaa acattcaa atgacgtcaaa acaaaagtaa ttctggcaag 420
 gcgaataact cgactgagga taaagcgtct caagataagt ctaaagatca tcataatggc 480
 aaaaaaggtg cagcgatcgg tgctggaaca gcaggtttgg ctggaggcgc agcaagtaaa 540
 agtgcttctg ccgcttcaaa accacatgcc tctaataatg c 581

<210> 87
 <211> 530

<212> DNA
<213> Staphylococcus aureus

<400> 87
tcgtgcatta gtaccatcag gtgcttcaac tggatgaacac gaagctgttg aattacgtga 60
tgagataaaa tcacgttatt taggtaaagg tggtactaaa gcagttgaaa acgttaatga 120
aatcatcgca ccagaaatta ttgaagggtga attttcagta ttagatcaag tatctattga 180
taaaatgatg atcgcattag acggtactcc aaacaaagggt aaattagggtg caaatgctat 240
tttaggtgta tctattgcag tagcacgtgc agcagctgac ttattagggtc aaccacttta 300
caaatatttta ggtggatttta atggtaagca gttaccagta ccaatgatga acatcgttaa 360
tggtggttct cactcagatg ctccaattgc attccaagaa ttcattgattt tacctgtagg 420
tgctacaacg ttcaaagaat cattacgttg gggactgaa atttccaca acttaaaatc 480
aattttaagc aaacgtgggt tagaaactgc agtaggtgac gaaggtgggt 530

<210> 88
<211> 560
<212> DNA
<213> Staphylococcus aureus

<400> 88
cgccaaaata gtgcttcaat atcagatagt tattattggg atatcattaa aaatctagaa 60
ttacaattta ctgctgcatt agatttatta gaagattatc gatatggtga aaaagagtat 120
gaaaaagcaa aagatcaact aatgacaagg atattaagtg aagtcaagta tttacttgag 180
caaaaaatta aagaatatga caagtataaa gatttatata aagaatatat gagtaaaaaat 240
ccaacgtcaa aggtaaaaag agcaaatttt gatcaatata atatcgaaga cctaagagaa 300
aaagaatata atgatttact aagttctatt aaagatgcgg tagaaacatt taaatcagat 360
gtacaaaaaa tagaatatga aaataaagag ttaaaatctt attcttacga agaagaaaag 420
aaggctgctt ctagagttga tgatttagca aataaagcgt atagcgttta ttttgcgttt 480
gttagggata cacaacataa aactgaggca ttagagttaa aagcgaaagt ggatttagtt 540
ttaggtgatg aggacaaacc 560

<210> 89
<211> 462
<212> DNA
<213> Staphylococcus aureus

<400> 89

tgaaaaataa attgatagca aaatctttat taacaatagc ggcaattggt attactacaa 60
 ctacaattgc gtcaacagca gatgcgagcg aaggatacgg tccaagagaa aagaaaccag 120
 tgagtattaa tcacaatatc gtagagtaca atgatgggtac ttttaaatat caatctagac 180
 caaaatttaa ctcaacacct aaatatatta aattcaaaca tgactataat attttagaat 240
 ttaacgatgg tacattcgaa tatgggtcac gtccacaatt taataaacca gcagcgaaaa 300
 ctgatgcaac tattaaaaaa gaacaaaaat tgattcaagc tcaaaatctt gtgagagaat 360
 ttgaaaaaac acatactgtc agtgcacaca gaaaagcaca aaaggcagtc aacttagttt 420
 cgtttgaata caaagtgaag aaaatggtct tacaagagcg aa 462

<210> 90
 <211> 584
 <212> DNA
 <213> Staphylococcus aureus

<400> 90
 aatcctcata acgcagaaag agtaaccttg aaatataaat ggaaatttgg agaaggaatt 60
 aaggcgggag attattttga ttccacatta agcgataatg ttgaaactca tggatatctca 120
 acactgcgta aagttccgga gataaaaagt acagatgggtc aagttatggc gacaggagaa 180
 ataattggag aaagaaaagt tagatatacg tttaaagaat atgtacaaga aaagaaagat 240
 ttaactgctg aattatcttt aaatctattt attgatccta caacagtgc gcaaaaaggt 300
 aacaaaaatg ttgaagttaa attgggtgag actacgggta gcaaaatatt taatattcaa 360
 tatttaggtg gagttagaga taattgggga gtaacagcta atggtcgaat tgatacttta 420
 aataaagtag atgggaaatt tagtcatttt gcgtacatga aacctaacaa ccagtcgtta 480
 agctctgtga cagtaactgg tcaagtaact aaaggaaata aaccaggggt taataatcca 540
 acagttaagg tatataaaca cattggttca gacgatttag ctga 584

<210> 91
 <211> 545
 <212> DNA
 <213> Staphylococcus aureus

<400> 91
 gctgggtgtg tactttatcct agtggcagca tatttggttg ctaaaccaca tatcgataat 60
 tatcttcacg ataaagataa agatgaaaag attgaacaat atgataaaaa tgtaaaagaa 120
 caggcgagta aagataaaaa gcagcaagct aaacctcaaa ttccgaaaga taaatcgaaa 180

gtggcaggct atattgaaat tccagatgct gatattaaag aaccagtata tccaggacca 240
gcaacacctg aacaattaa tagagggtga agctttgcag aagaaaatga atcactagat 300
gatcaaaata tttcaattgc aggacacact ttcattgacc gtccgaacta tcaatttaca 360
aatcttaaag cagccaaaaa aggtagtatg gtgtacttta aagttggtaa tgaaacacgt 420
aagtataaaa tgacaagtat aagagatggt aagcctacag atgtaggagt tctagatgaa 480
caaaaaggta aagataaaca attaacatta attacttggt atgattacaa tgaaaagaca 540
ggcgt 545

<210> 92
<211> 527
<212> DNA
<213> Staphylococcus aureus

<400> 92
ttaacaatag aacatttaac aaagaagata ggcaacaaaa cgattctcga agatgtatca 60
tttaagctga aacgcggaca aatagttggt ctcggttgag cgaatggtgc aggtaaaaca 120
actttaatga aagttatatt aggttactct agtttccaaa gcgggaattt taatgttatt 180
aacagcaagg acgaaaaaag caatatcggc gcattgattg aaaatccagg aatatatcct 240
tttatgtctg gatatgaaaa cttgaagtta ttgaatgaat caaaaaacac tcaagatata 300
gataaaattg tctcacaact tcatatggat gaatacatc ataaaaaagc taaaacgtat 360
tctcttggtg tgaaacaaaa attaggaatt gctatagcat ttttaaataa acctcaattc 420
attatcttag atgaaccaat gaatggctta gatccaaaag ctgtgcgaga tgtacgtgaa 480
ttgattgtcc aaaaagcgca agaagtggtt actttcttaa tttcgag 527

<210> 93
<211> 645
<212> DNA
<213> Staphylococcus aureus

<400> 93
aaatggttca gtcgtaatgg cgacagggtga agtttttagaa ggtggaaaga ttagatatac 60
atttacaat gatattgaag ataagggtga tgtaacggct gaactagaaa ttaatttatt 120
tattgatcct aaaactgtac aaactaatgg aaatcaaact ataacttcaa cactaaatga 180
agaacaaaact tcaaggaat tagatgttaa atataaagat ggtattggga attattatgc 240
caattttaat ggatcgattg agacatttaa taaagcgaat aatagatttt cgcatgttgc 300

atttattaaa cctaataatg gtaaaacgac aagtgtgact gttactggaa ctttaatgaa 360
 aggtagtaat cagaatggaa atcaaccaa agttaggata tttgaatact tgggtaataa 420
 tgaagacata gcgaagagtg tatatgcaaa tacgacagat acttctaaat ttaaagaagt 480
 cacaagtaat atgagtggga atttgaattht acaaaataat ggaagctatt cattgaatat 540
 agaaaatcta gataaaactt atgttggtca ctatgatgga gagtatttaa atggtactga 600
 tgaagttgat tttagaacac aaatggtagg acatccagag caact 645

<210> 94
 <211> 548
 <212> DNA
 <213> Staphylococcus aureus

<400> 94
 ggtattgcat ctgtaacttt aggtacatta cttatatctg gtggcgtaac acctgctgca 60
 aatgctgcgc aacacgatga agctcaacaa aatgcttttt atcaagtgtt aaatatgcct 120
 aacttaaacy ctgatcaacy taatggtttt atccaaagcc ttaaagatga tccaagccaa 180
 agtgctaacy ttttaggtga agctcaaaaa cttaatgact ctcaagctcc aaaagctgat 240
 gcgcaacaaa ataagttcaa caaagatcaa caaagcgctt tctatgaaat cttgaacatg 300
 cctaacttaa acgaagagca acgcaatggt ttcatthcaa gtcttaaaga cgatccaagc 360
 caaagcacta acgttttagg tgaagctaaa aaattaaacy aatctcaagc accgaaagct 420
 gacaacaatt tcaacaaaaga acaacaaaat gctttctatg aaatcttgaa catgcctaac 480
 ttgaacgaag aacaacgcaa tggtttcatc caaagcttaa aagatgaccc aagtcaaagt 540
 gctaacct 548

<210> 95
 <211> 304
 <212> DNA
 <213> Staphylococcus aureus

<400> 95
 gttatcaatt aatacaaccc ctgaagcaat tcgatacatt aaacctgcag attttcatgt 60
 tcctggcgat atttcatctg cagcgttctt tattgttgca gcacttatca caccaggaag 120
 tgatgtaaca attcataatg ttggaatcaa tccaacacgt tcaggtatta ttgatattgt 180
 tgaaaaaatg ggcggttaata tccaactttt caatcaaaca actggtgctg aacctactgc 240
 ttctattcgt attcaatata caccaatgct tcaaccaata acaatcgaag gagaattagt 300

tcca 304

<210> 96
 <211> 269
 <212> DNA
 <213> Staphylococcus aureus

<400> 96
 gtagttgaaa atatgcctgt tggtagtagt agttatgtac attatgatcg taaattagat 60
 ggaagaatag cacaggggtg cgttagtatt aatgcattta aagggtgaag ttttggagaa 120
 ggatttaaag cagctgaaaa gcctggtagc gaaattcaag acgaaattct ctacaatact 180
 gaattgggct attatcgtgg gtcaaatcac ttaggtgggt tagaaggcgg tatgtcaaatt 240
 ggaatgccaa ttatcgtaa tgggtgtaatt 269

<210> 97
 <211> 305
 <212> DNA
 <213> Staphylococcus aureus

<400> 97
 agacttatta tctaaacgtg gtgaactagc acaaaaaatt ggggaagaaa aattaaaaca 60
 aggtacacgt atctatgatc cacaacgtga aaaagaaatg cttaacgact taatcgatag 120
 taacaaagga ccattcaacg ataatactat taagcaatta tttaaagaaa ttttcaaagc 180
 ctctacagat ttacaaaaat ctgaaaatga aaacattta tatgtatcac gtaagttgaa 240
 acctgaagat acgattgtaa catttgataa tgggggcatt attggagacg gcaataaatc 300
 atttg 305

<210> 98
 <211> 287
 <212> DNA
 <213> Staphylococcus aureus

<400> 98
 aaaattgctg gtatcgctgc acgtgaagtt aaaggtatct tagacatgaa aggtggctta 60
 actgatacat tactaatgc attctcaagt ggaaataacg ttactcaagg tgtatctggt 120
 gaagttgggtg aaaaacaagc tgctgtagac ttaaaagtaa ttttagaata tgggtgaatca 180
 gcacctaaaa tcttccgtaa agtaactgaa ttagtaaaag aacaagttaa atatattact 240
 ggtttagatg ttgttgaagt taacatgcaa gttgacgatg taatgac 287

<210> 99
<211> 429
<212> DNA
<213> Staphylococcus aureus

<400> 99
agctgagacg acacaagatc aaactactaa taaaaacggt ttagatagta ataaagttaa 60
agcaactact gaacaagcaa aagctgaggt aaaaaatcca acgcaaaaca tttctggcac 120
tcaagtatat caagaccctg ctattgtcca accaaaaaca gcaaataaca aaacaggcaa 180
tgctcaagta agtcaaaaag ttgatactgc acaagtaaat ggtgacactc gtgctaataca 240
atcagcgact acaaataata cgcagcctgt tgcaaagtca acaagcacta cagcacctaa 300
aactaacact aatgttacaa atgctgggta tagtttagtt gatgatgaag atgataattc 360
agaaaatcaa attaatccag aattaattaa atcagctgct aaacctgcag ctcttgaaac 420
gcaatataa 429

<210> 100
<211> 536
<212> DNA
<213> Staphylococcus aureus

<400> 100
cgggattctc tgcattatcc cccacggcaa caccctaat aaactcttca atgttaaaaa 60
caagacacaa atgactgata atactaagtt tattaatatt gatacgaaca caccaaagta 120
tcgagttaat aaaaagttga gcggtatcaa tggtagagat actacatata tcaacaatat 180
tgtcaccaat aacaacatag cattaaccgg atgtggatta ataattaggt cacctatata 240
agcaataata aatactaaaa agcaatgtac caaaaatgct attgataaaa tgaaaatctt 300
tgctcttatt tcttttgtaa tcgaccaatt attacttaag taataattaa atgatttatt 360
tctcatttca attttaaata acgaattaca agccatacat aatacaatcg ggatgaaagc 420
aattggccaa atattaaata gtaaagttat atatggtgac aactatttcg ctgttccgt 480
attacttttg gcgaataaga ctgtgaaaat agcaaaacaa agaaatacca gcggac 536

<210> 101
<211> 637
<212> DNA
<213> Staphylococcus aureus

<400> 101
ttaattgttc taccgctoca tttattaaat cttttaaaga gtaaaactgc taatagcaac 60

gtgataataa tatagattgc caatgttaat gtaactggta tactcccttc gataaacata 120
 taaacgtaac gtgtagcata tgtgattggt aaatagaacc acgaatgatc tccaagcact 180
 tctaattccaa aataaacggt aaaaataaac attaaaactc cgacaacaat agccattaca 240
 tctttaatga aaatactaaa aataaaaagt agcagtaata taattacatt gaaaaacaat 300
 gatagccta taaacataag tggtattttc atatcatgtg aatgccacaa taaattaatt 360
 gatgctaata gaatacatat ggctgtaata gtataagtaa aaatcattga tgcatttaac 420
 caatttagcc tattagcttt tcttaaaata tgattaaagt gaccaatatt ttcttcaaaa 480
 ttgataactt gatagacggt tatagaaatt aatagcgatg taattgcatt aaaactcgct 540
 gtaaacaaac ttatttgctg accattccat aaatttacgt ttaaatacca atttataaat 600
 aatataaaca atatgggtac aataatgggt acaaatg 637

<210> 102
 <211> 507
 <212> DNA
 <213> Staphylococcus aureus

<400> 102
 aaagataatt ggtttgctga aaaaccagtc ctctaaagaa tcgaatgtta agattcatcg 60
 cttggcgat attacaaact caaaatttga tggcaataac tatatagata gatggtgtaa 120
 aatcaggaat tctcacattg gtgaatacag ttatatggga tttggtagtg attttaataa 180
 tgtagaagta ggaagatatt gttcgatatc ttcggtatga aaaattgggt taggaaaaca 240
 tctacacac ttttttagct catcacgat tttttattct aataataatc catttaacat 300
 aaagcaaaag tttatagact ttaatgacca accaagccgt acaacaatta aaaatgatgt 360
 gtggattggt gcaaatgtaa ttattatgga tggtttaaca ataaatactg gtgcagtcac 420
 agcagccggc tcagttgtta ctaaaaatgt aggagcatat gaggttggtg gtggggttcc 480
 tgcaaaagtg attaagaagc gatttga 507

<210> 103
 <211> 639
 <212> DNA
 <213> Staphylococcus aureus

<400> 103
 caagggact taaacaaata gaaacaatta aagacgttac ggatgattat aaaattggtg 60
 gaatgaataa ttcacaagct actaataagc gattggaaaa tttagattgt aattatcggt 120

| | |
|---|-----|
| tgtaggtag caaggtagat ccaaaaaata ttctttctaa attaattaag cgtataagat | 180 |
| ttgcaacagg tggtatccga gaaattaaag cttataaacc tgacgtgatt catgcaaag | 240 |
| atttcgacgt attattaatg gtctatttaa gcaattataa aaaagctaatt attgtttatg | 300 |
| atgcatgcatga aatatatgag aaaaatgcct ttattaataa agttccactt atttcaaagt | 360 |
| ttgtagaaag tatagaaaaa cacatagtaa aacatcgtgt taatgccttc gtaacagtaa | 420 |
| gtcatgcagc aaaagaatat tatcaatcta aaggatataa gaaggaagcg aatgttatta | 480 |
| cgaatgcacc tatttttaaat gatagcagag aatttaaaga aatcgaaaac tttaaagaaa | 540 |
| ttgtatatca aggtcaaatt gtaatggaca gaggatatga agagtttatt attgcttcat | 600 |
| cagcttttaa acaaaatgct ccttcattca taattcgag | 639 |

<210> 104
 <211> 380
 <212> DNA
 <213> Staphylococcus aureus

| | |
|--|-----|
| <400> 104 actttgtgca attatcagca tgaacatatt tatagtaate tctacattta ctaaagaagt | 60 |
| attagggttc cctatagagc cgggtgtatta ctcaaccatg gttggtatag cattaattac | 120 |
| cacggtgttt gctatttata agataattgt cacgcaagaa attccgagag ggtaaatatt | 180 |
| attaattgct atatgtttgc tttatctagc tttttattat ttttcaccag ataaggaaga | 240 |
| gaaactagct aaaaataata ttctattctt tttaacatgg gcagttccag cggcaattag | 300 |
| tggtatttat attaaatata taaacaaggc tacggtagaa agatttttta aattagtatt | 360 |
| tttcatattt tctgtttcat | 380 |

<210> 105
 <211> 500
 <212> DNA
 <213> Staphylococcus aureus

| | |
|---|-----|
| <400> 105 ttatggatag cgtaaagaca ataattggta cgttgcttat agcttttagga ttacaatttt | 60 |
| tagcttatcc aattattaat caacgagtag gtaatgaagc gtttggttct attttaacga | 120 |
| tttatacaat aataacaatc acgagtgttg tattaggcaa tacgtttaac aatatacgat | 180 |
| tgattaatat gaatctatac aaatccaatc attactactg gaaatttgtg tcgatacttt | 240 |
| taatttcaat tctgattgag agtatagctt taattattgt atttctttac ttttttaatt | 300 |

| | |
|--|-----|
| tgaacacccat cgatattatc tttttaattc tacttaatat tttaatgtgt ttaaggattt | 360 |
| atctgaatgt attttttagg atgactttaa aatataatca gattttgtat attgctctta | 420 |
| ttcaattttt aggtttgctg ataggactat ttctatatta tttaatccaa aactggattg | 480 |
| tttgttttat taccagtga | 500 |

<210> 106
 <211> 522
 <212> DNA
 <213> Staphylococcus aureus

| | |
|--|-----|
| <400> 106 | |
| gattcttggc gctactaaca ttaagcatat gtcattatta tcacattatt taaaccacat | 60 |
| tgatttgaat atcaatgagg tggacattat atacactgac aaatatgata tcgaagaaca | 120 |
| tatccaaggc atcaataatt actataaata taaagtagat attaaagaag attggacatt | 180 |
| tatcaaaaaa gctattgctt actatcgatt taggccatac gctatgaaaa ttcttaaaga | 240 |
| aaatcgttat gattttgtca tagtatgggg aagttataca ggacacttat ttaaaagttt | 300 |
| tttagaaaaa cactataaaa ataaattcat tttaaatata agggactact tttttgaaaa | 360 |
| taataaactt attaaagtata gaatgaaaaa aatcgttgat gctagcaggg tgacaacatt | 420 |
| atcttcagaa ggttttctta aatttttacc taaatctgaa aaatatagaa ttatttatag | 480 |
| ttataacatg agtattatta gagaaagtaa tgtaaccgat gg | 522 |

<210> 107
 <211> 655
 <212> DNA
 <213> Staphylococcus aureus

| | |
|---|-----|
| <400> 107 | |
| taatgtttcc ttgccttatg ttaggtgata aacctttatt attttttagca cctataagtt | 60 |
| atggagtagg aaagctcttt ataagcttct cgaataatcc gaattttaaa ttttcgaaaa | 120 |
| ttgtatacga tgtttttaggt tttcttagat tagtatattat acctgctatg atagtgtttt | 180 |
| tccaggatcc aactatagat aatttaccat taggacaagc ttattttaat caagcgggta | 240 |
| tttatatgag tgtggagttt atcataggct cgctatttat attgatacta tctaaattat | 300 |
| tcaaacatga agtggatca agaaatagct ttacactttc tggatcatca atttattaca | 360 |
| ttgtgtttgg tctgtttatt tgtgggattt ttgtagcttt tcccgaagtg cgcaaaaaca | 420 |
| tatcatTTTT aattattaaa acagatgcaa tgggaagagg aaccgaagca acaagtgggt | 480 |

taaatgttct ttttgtaatg ctatttcaac ttgccttagc gttattattc ttaataatcg 540
 catatgcttc atataaaaag tataaaagaga atcctaaaat tatttatgtt gtattaccgc 600
 tagctatagg aattttaaat attagtttaa ttgttggtga aagaagaagt tatca 655

<210> 108
 <211> 459
 <212> DNA
 <213> Staphylococcus aureus

<400> 108
 gtaaaaacat ttatgaaatc gaaaatattt agattaatga atacaccact attattattt 60
 tataagaaag aatattttaac tggatattat tttgaaaata aagtggctgg atggttatgg 120
 gcgtggaaag ctgttccgtt caagttgtta ggaataaata caagtttgcc atttcctgca 180
 gatataactg ttagaatgca taaccctaata aacattgttt ttgataaaaa tgatattcat 240
 atttttcaat cgcccgggac gtatttttaata aatttttcag cagttatata tataggtaga 300
 ggtgtttata tagcgcctaa cgtaggtatt attacagcta atcataatat taaaaatttg 360
 aagtcacatg caccagggtga agatgtcaaa atagggaatt atagttggat tggaatgaac 420
 tcagttatat taccaggagt agaattgggg gaacataca 459

<210> 109
 <211> 562
 <212> DNA
 <213> Staphylococcus aureus

<400> 109
 aagatacgat ttgttgattg tgaataccaa aaatgaccgt agtgctaata tactttcaca 60
 aatcagtttt ttgatatcat tgcttatattt attaatactg ataccaatat ttgcgattag 120
 tgcattgttta taccctaaact ttatattaga ttttatattc attattatta tgttggtttt 180
 ggtaagttta acaaacattt ttacaaatta tctaaataag gaaagaaagt ataaagtgtt 240
 aagtttgatt aatgtgttta gagctggatc aatggcttta cttcaaatca ttttcggact 300
 tttagcatta ggaagtttag gattaattat tgggttttca ttatcctata tcgcaggcat 360
 tacactagga tataaaacgt ttaaaaagca ctttaatat gtgagagata aagaagaaac 420
 taaagcatta tttttagaaa ataaaaatca gttagtttat tcaacaccat caatattatt 480
 aaatagtttg tctttctcgg ttgttgtgtt ctttataggt attttgtata ccaatacaga 540
 agtgggtatt tatggtatgg cc 562

<210> 110
<211> 104
<212> DNA
<213> Staphylococcus aureus

<400> 110
ttttatctta attaaggaag gagtgatctt aatggcaca gatattcatt caacaatcag 60
tgacttagta aaatggatta tcgacacagt gaacaaattc acta 104

<210> 111
<211> 351
<212> DNA
<213> Staphylococcus aureus

<400> 111
aaatatcaaa tcgctgtggc tgatacgaat gttcaaacgc cagattatga aaagttgagg 60
aacacatggc tggacgttaa ctatggttat gataagtatg atgagaagaa tgacgcaatg 120
aagaagaagt ttgaggctac ggagaatgag gcaaagaaat tacttagtga gatgaaaact 180
gaaagtgata ggaaatactt gtgggaaaac tcaaaagatt tagatacgaa gtctgcggat 240
atgactcgta cctatcgtaa tattgagaaa atcgcagaag cgatgaagca taaagatact 300
aagttaaaaa tagatgaaaa caagaagaaa gtgaaagatg cccttgagtg g 351

<210> 112
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 112
gggttcttgc tgtctttaag tgattcagag aatacttctt gtgcacgttc tgggtgttcg 60
cgtaatgttt tgatgtattg gttacgttgt tcttctgtga taccttttag atgtaatact 120
tgataaaaag ctttttgttg atctgttacg tagttgtttt gagttgtttg gtgcttagtt 180
gaagtttggt gcgtgttttc actcgctttt gcttcccat ttgaaatcat tgtagctaaa 240
gtaattgttg ctgcccacac tagcaacttc gagatata 278

<210> 113
<211> 226
<212> DNA
<213> Staphylococcus aureus

<400> 113
aaagatagtt ctaagataaa tgggtccatta agactcgcag gtggagatat taataagcta 60

gattcaacaa ctcaagacaa agtaagaaga ttagattcat ctatttctaa atctactact 120
 cctgaatctg tatacgttta tagactttta aatttagatt atttgacaag tatcgttgga 180
 ttacaaaatg aagatttata taaattacaa cagaccaata atggcc 226

<210> 114
 <211> 576
 <212> DNA
 <213> Staphylococcus aureus

<400> 114
 gctagtgcac ttgttattca agacgaactg atgcaaaaa accatgcaaa agcagaagtt 60
 tcagcagaag aaataaaaaa acatgaagag aaatggaata agtactatgg tgtcaatgca 120
 ttttaatttac caaaagagct ttttagtaaa gttgatgaaa aagatagaca aaagtatcca 180
 tataatacta taggtaatgt ttttgtaaaa ggacaaacaa gtgcaactgg tgtgttaatt 240
 ggaaaaaata cagtttctaac aaatagacat atcgctaaat ttgctaattg agatccatct 300
 aaagtatctt ttagaccttc tataaatata gatgataacg gtaatactga aacaccatat 360
 ggagagtatg aagtcaaaga aatattacaa gaaccatttg gtgcaggtgt tgatttagca 420
 ttaatcagat taaaaccaga tcaaaacggt gtttcattag gcgataaaat atcgccagca 480
 aaaataggga catctaata tttaaaagat ggagacaaac tcgaattaat aggctatcca 540
 ttcgatcata aagttaacca aatgcacaga agtgaa 576

<210> 115
 <211> 630
 <212> DNA
 <213> Staphylococcus aureus

<400> 115
 ttttagcagc gtcaattttt actatttcct tacctgtgat tccttttgaa agtacattac 60
 aagcaaaaga atacagcgca gaagaaatca gaaaattaaa acaaaaattt gaggttccac 120
 ctacagataa agagctttat acacacatta cggataatgc aagaagtcct tataattctg 180
 ttggtacagt gtttgcataa ggtagtacat tagctaccgg agttttaatt ggtaaaaaata 240
 caattgttac taattaccac gttgcaagag aagcagccaa aaacccatcg aatattatct 300
 ttacacccgc tcaaaataga gatgcagaaa aaaatgaatt ccctactccg tatggaaaat 360
 ttgaagctga agaaattaaa gaatctccgt atggacaagg actcgattta gctataataa 420
 aattaaaacc aaacgaaaaa ggggaatcag cgggagattt aattcaacca gctaataata 480

ctgatcatat tgatatacaa aaaggagaca aatattcttt attaggatat ccttataatt 540
 attcagctta ctctttatat caaagtcaga ttgaaatggt caatgattct caatattttg 600
 gatatactga ggtaggaaac tctggatcag 630

<210> 116
 <211> 330
 <212> DNA
 <213> Staphylococcus aureus

<400> 116
 agaaagaaag tgatttctat gattaaaaat aaaatattaa cagcaacttt agcagttggt 60
 ttaatagccc ctttagccaa tccatttata gaaatttcta aagcagaaaa taagatagaa 120
 gatatcggcc aagggtgcaga aatcatcaaa agaacacaag acattactag caaacgatta 180
 gctataactc aaaacattca atttgatttt gtaaaagata aaaaatataa caaagatgcc 240
 ctagttgtta agatgcaagg cttcattagc tctagaacaa catattcaga cttaaaaaaa 300
 tatccatata ttaaaagaat gatatggcca 330

<210> 117
 <211> 350
 <212> DNA
 <213> Staphylococcus aureus

<400> 117
 tcgttacacc gaatgggcaa gtatctgcat atgatcaata cttatttgca caagacccaa 60
 ctggtccagc agcaagagac tatttcgtcc cagataatca actacctcct ttaattcaaa 120
 gtggctttta tccatcatatt attacaacat tgtcacacga aaaaggtaaa ggtgataaaa 180
 gcgagtttga aatcacttac ggcagaaaca tggatgctac atatgcatac gtgacaagac 240
 ctcgttttagc cgttgataga aaacatgatg cttttaaaaa ccgaaacggt acagttaaatt 300
 atgaagtga ctggaaaaca catgaagtaa aaattaaaag catcacacct 350

<210> 118
 <211> 221
 <212> DNA
 <213> Staphylococcus aureus

<400> 118
 ttttaagcgt ctatcacaca gacaagatgg cgctaaaaaa tctaaaatta cagtaactta 60
 tcaacgtgaa atggatttat accaaattcg ttggaatggc ttctactggg caggcgcgaa 120
 ttataaaaaac tttaaaacta gaacatttaa atcaacatat gaaattgatt gggaaaatca 180

caaagtgaaa ttgttagata caaaagaaac tgaaaacaat a 221

<210> 119
 <211> 337
 <212> DNA
 <213> Staphylococcus aureus

<400> 119
 ttgatagcga tttatttgta ggctacaaac ctcatagtaa agatcctaga gattatttcg 60
 ttccagacag cgagttacca cctcttgtag aaagtggatt taacccttca tttatcgcaa 120
 cagtatctca cgaaaaaggt tcaagcgaca cgagcgaatt tgaaatcact tatggaagaa 180
 atatggatgt cactcatgcc attaaaagat caacacatta tggcaacagt tatttagatg 240
 gtcatagagt ccataatgca tttaaaaata gaaactacac tgtgaaatat gaagtcaatt 300
 ggaagactca cgaaatcaaa gtgaaaggac agaattg 337

<210> 120
 <211> 752
 <212> DNA
 <213> Staphylococcus aureus

<400> 120
 gtcagctcag taacaacaac actattgcta ggttccatat tgatgaatcc tgtcgctggt 60
 gccgcagatt ctgatattaa tattaaaacc ggtactacag atattggaag caatactaca 120
 gtaaaaacag gtgatttagt cacttatgat aaagaaaatg gcatgcacaa aaaagtattt 180
 tatagtttta tcgatgataa aaatcacaaat aaaaaactgc tagttattag aacgaaaggt 240
 accattgctg gtcaatatag agtttatagc gaagaagggtg ctaacaaaag tggtttagcc 300
 tggccttcag cttttaagggt acagttgcaa ctacctgata atgaagtagc tcaaatatct 360
 gattactatc caagaaatc gattgatata aaagagtata tgagtacttt aacttatgga 420
 ttcaacggta atgttactgg tgatgatata ggaaaaattg gcggccttat tggtgcaaat 480
 gtttcgattg gtcatacact gaaatatgtt caacctgatt tcaaaacaat tttagagagc 540
 ccaactgata aaaaagtagg ctggaaagggt atatttaaca atatggtgaa tcaaaattgg 600
 ggaccatatg atagagattc ttggaacccg gtatatggca atcaactttt catgaaaact 660
 agaaatgggt ctatgaaagc agcagataac ttccttgatc ctaacaaagc aagttctcta 720
 ttatcttcag ggttttcacc agacttcgct ac 752

<210> 121
<211> 507
<212> DNA
<213> Staphylococcus aureus

<400> 121
tgttatcgac cgttttgtat ccaaattggg ggcaatataa acgcgctgat ttaatcggac 60
aatcttctta tattaaaaat aatgatgtcg taatattcaa tgaagcattt gataatgggtg 120
cttcagacaa attattaagt aatgtgaaaa aagaatatcc ttaccaaaca cctgtactcg 180
gtcgttctca atcaggttgg gacaaaactg aaggtagcta ctcatcaact gttgctgaag 240
atggtggcgt agcgattgta agtaaatatc ctattaaaga gaaaatccag catgttttca 300
aaagcggttg tggattcgat aatgatagca acaaaggcctt tgtttataca aaaatagaga 360
aaaatggtaa gaacgttcac gttatcggtg cacatacaca atctgaagat tcacgttgtg 420
gtgctggaca tgatcgaaaa attagagctg aacaaatgaa agaaatcagt gactttgtta 480
aaaagaaaaa tatcccaaaa gatgaaa 507

<210> 122
<211> 213
<212> DNA
<213> Staphylococcus aureus

<400> 122
ggtgtcctat ctcgaaaaca aaacgctgca aaaaaatcaa aaattactgt tacttatcaa 60
agtgaaatgg atagatatac aaacttttgg atcaacttca actggatagg taataattat 120
aaagatcaca taagagcaac tcatacatca atttatgaag ttgattggga aaatcataca 180
gttaaattaa tagatactca atctaaggaa aaa 213

<210> 123
<211> 220
<212> DNA
<213> Staphylococcus aureus

<400> 123
ataaagaaag gaaatgattt tatggtcaaa aaaagactat tagctgcaac attgtcggtta 60
ggaataatca ctctatttgc tacttcgttt catgaatcta aagctgataa caatattgag 120
aatattggtg attgcgctga ggtagtcaaa agaacagaag atacaagttg cgataagtgg 180
ggggtcacac aaaatattca gtttgatttt gttaaagata 220

<210> 124

<211> 359
<212> DNA
<213> Staphylococcus aureus

<400> 124
atcattaggt aaaatgtctg gacatgatcc aaatttattt gttggatata aaccatatag 60
tcaaaatccg agagactatt ttgtgccaga caatgaatta cccccattag tacacagtgg 120
tttcaatcct tcattttattg caactgtttc tcatgaaaaa ggctcaggag atacaagtga 180
atttgaaata acgtatggca gaaatatgga tgttactcat gctactagaa gaacaacaca 240
ctatggcaat agttatttag aaggatctag aatacacaag gcatttgtaa acagaaatta 300
cacagttaaa tatgaagtga actggaaaac tcatgaaatt aaagtgaag gacataatt 359

<210> 125
<211> 612
<212> DNA
<213> Staphylococcus aureus

<400> 125
aagttgctca aatacaagct ggtttacaat ataaaccaca agtacaacgt gtaccaggta 60
agtggacaga tgctaacttt aatgatgtta agcatgcaat ggatacgaag cgttttagctc 120
aagatccagc attaaaaatat caattcttac gcttagacca accacaaaat atttctattg 180
ataaaaattaa tcaattctta aaaggtaaag gtgtattaga aaaccaaggt gctgcattta 240
acaaagctgc tcaaatgtat ggcattaatg aagtttatct tatctcacat gccctattag 300
aaacaggtaa cgg tacttct caattagcga aagggtgcaga ttagtgtaac aacaaagttg 360
taactaactc aaacacgaaa taccataacg tatttgggtat tgctgcatat gataacgac 420
ctttacgtga aggtattaaa tatgctaaac aagctgggtg ggacacagta tcaaaagcaa 480
tcgttgggtg tgctaaatc atcggaact catatgtaaa agctgggtcaa aatacacttt 540
acaaaatgag atggaatcct gcacatccag gaacacacca atatgctaca gatgtagatt 600
gggctaacat ca 612

<210> 126
<211> 401
<212> DNA
<213> Staphylococcus aureus

<400> 126
tgttattatt ctcatcttct tcaattacta atgaggtaag tgcacaaagt tcattcgaca 60
aaggaaaata taaaaagggc gatgacgcga gttattttga accaacaggc ccgtatttga 120

tggtaaatgt gactggagtt gatggtaaag gaaatgaatt gctatcccct cattatgtcg 180
 agtttcctat taaacctggg actacactta caaaagaaaa aattgaatac tatgtcgaat 240
 gggcattaga tgcgacagca tataaagagt ttagagtagt tgaattagat ccaagcgcaa 300
 agatcgaagt cacttattat gataagaata agaaaaaaga agaaacgaag tctttcccta 360
 taacagaaaa aggttttggt gtcccagatt tatcagagca t 401

<210> 127
 <211> 715
 <212> DNA
 <213> Staphylococcus aureus

<400> 127
 ttttattcat tgcctaacg ttgacaacaa gtccacttgt aaatggtagc gagaaaagcg 60
 aagaaaataa tgaaaaagat ttgcgaaaaa agtctgaatt gcagggaaaca gctttaggca 120
 atcttaaaaca aatctattat tacaatgaaa aagctaaaac tgaaaaataa gagagtcacg 180
 atcaatTTTT acagcatact atattgttta aaggctTTTT tacagatcat tcgtggtata 240
 acgatttatt agtagatttt gattcaaagg atattgttga taaatataa gggaaaaaag 300
 tagacttgta tgggtgcttat tatggttatc aatgtgcggg tggtagacca aacaaaacag 360
 cttgtatgta tgggtggtgta acgttacatg ataataatcg attgaccgaa gagaaaaaag 420
 tgccgatcaa tttatggcta gacggtaaac aaaatacagt acctttggaa acggttaaaa 480
 cgaataagaa aaatgtaact gttcaggagt tggatcttca agcaagacgt tatttacagg 540
 aaaaatataa tttatataac tctgatgttt ttgatgggaa ggttcagagg ggattaatcg 600
 tgtttcatac ttctacagaa cttcgggtta attacgattt atttggtgct caaggacagt 660
 attcaaatac actattaaga atatatagag ataataaaac gattaactct gaaaa 715

<210> 128
 <211> 233
 <212> DNA
 <213> Staphylococcus aureus

<400> 128
 cgtagatgtg tttggagcta attattatta tcaatgttat ttttctaaaa aaacgaatga 60
 tattaattcg catcaaactg acaaacgaaa aacttgtagt tatggtggtg taactgagca 120
 taatggaaac caattagata aatatagaag tattactggt cgggtatttg aagatggtaa 180
 aaatttatta tcttttgacg tacaaaactaa taagaaaaag gtgactgctc aag 233

<210> 129
 <211> 360
 <212> DNA
 <213> *Staphylococcus aureus*

<400> 129
 aatttttggc acatgattta atttataaca ttagtgataa aaaactgaaa aattatgaca 60
 aagtgaaaac agagttatta aatgaagggt tagcaaagaa gtacaaagat gaagtagttg 120
 atgtgtatgg atcaaattac tatgtaaaact gctatttttc atccaaagat aatgtaggta 180
 aagttacagg tggcaaaact tgtatgtatg gaggaataac aaaacatgaa ggaaaccact 240
 ttgataatgg gaacttacia aatgtactta taagagttaa tgaaaaataa agaaacacaa 300
 tttcttttga agtgcaaaact gataagaaaa gtgtaacagc tcaagaacta gacataaaag 360

<210> 130
 <211> 501
 <212> DNA
 <213> *Staphylococcus aureus*

<400> 130
 ccacctgttg aaggaagagg agttattaat tctagacagt ttttatctca tgatttaatt 60
 tttccaattg agtataagag ttataatgag gttaaaactg aattagaaaa tacagaatta 120
 gctaacaatt ataaagataa aaaagtagac atttttggcg ttccatattt ttatacatgt 180
 ataataccta aatctgaacc ggatataaac caaaattttg gaggttggtg tatgtatggt 240
 ggtcttacat ttaatagttc agaaaaatgaa agagataaat taattactgt acaggtaaca 300
 atcgacaata gacaatcact tggatttaca ataactacia ataagaatat gggtactatt 360
 caggaactag attacaaagc aagacactgg ctactaaag aaaaaaagct atacgagttt 420
 gatggttctg catttgaatc tggatatata aaatttactg aaaagaacaa tacaagtttt 480
 tggtttgact tatttcctaa a 501

<210> 131
 <211> 542
 <212> DNA
 <213> *Staphylococcus aureus*

<400> 131
 gaagatttac acgataaaag tgagttaaca gatttagctt tagctaagtc atatggtcaa 60
 tataatcacc cattcattaa agaaaatatt aagagtgatg aaataagtgg agaaaaagat 120

ttaatatatta gaaatcaagg tgatagtggc aatgatttga gagtaaagtt tgcaactgct 180
gatttagctc agaagtttaa aaataaaaat gtagatatat atggggcatc tttttattat 240
aagtgtgaaa aaataagtga aaatatattct gaatgtctat atggaggtac aacactaaat 300
agtgaaaaat tggcacagga aagggtgatt ggtgctaata tttgggtaga tggatttcaa 360
aaagaaacag aattaatacg aacaaataag aaaaatgtga cattgcaaga attagatata 420
aagatcagaa aaatatgtgc cgataaatat aaaatttatt ataaagacag cgaaataagt 480
aaaggtctaa ttgaatttga tatgaaaact cctagagatt actcattcga catttatgat 540
tt 542

<210> 132
<211> 343
<212> DNA
<213> Staphylococcus aureus

<400> 132
agtcttatct aacggcgatg taggtccagg aaatctaaga aattttttata ctaaatatga 60
atatgtgaat ttaaagaatg ttaaagacaa aaattcacca gaatcacacc gcttagaata 120
ctcgtataaa aatgatacat tgtatgctga atttgacaat gaatatataa ctagtgatct 180
aaagggaaaa aatgtcgatg tttttggtat aagctataaa tatggttcta actctcgtag 240
tatatatggt ggtgttacta aagcagaaaa caataaatta gattcgccaa gaataatacc 300
tataaattta attatcaatg gcaagcatca aacagttaca act 343

<210> 133
<211> 272
<212> DNA
<213> Staphylococcus aureus

<400> 133
ggatataaat acggaaataa agttacattt atagataatt ctcaacaaat tgatgttaca 60
ttgacaggaa atgaaaaatt aactgttaaa gatgatgacg aagttttctaa tgttgacgtg 120
ttttagtaga gagaaggtag tgacaaatca gctatcacia catcgattgg tgggaattaca 180
aagacaaatg ggactcaaca taaagatact gttcaaaacg ttaatttgtc agttttctaag 240
agtacaggtc aacacactac ttctgtgact tc 272

<210> 134
<211> 450
<212> DNA

<213> *Staphylococcus aureus*

<400> 134

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atgaaattta aagcgatagc aaaagcaagt ttagcattgg gaatgtagc aacagggtgta      60
attacatcga atgtacaatc agtacaagcg aaaacagaag ttaaacaaca aagtgaatca      120
gagttgaaac actattataa taaaccggtt ttagagcgta aaaatgttac tggatataaa      180
tatactgaaa aaggtaaaga ttatatagat gttatagtag acaatcaata ttctcaaatt      240
tcttttagttg gatctgataa agacaaatth aaagatggag acaactcgaa tatagatgtg      300
tttatcctta gagaagggtga cagtagacaa gcaacaaatt actcaattgg tggcgtaaca      360
aaaacaaaca gtcaaccttt tattgactat atacacacac caatccttga aatcaagaaa      420
ggtaaagaag aaccacaaag tagtttatac      450
```

<210> 135

<211> 500

<212> DNA

<213> *Staphylococcus aureus*

<400> 135

```
gtattgaata taaaaatgtg acaggttata tcagtttcat tcaaccaagt attaaattta      60
tgaatatcat agatggtaat tctgttaata accttgcttt aattggcaaa gataagcaac      120
attatcatalc ggggtgtacat cgtaatctta atatatttta cgттаatgag gataagagat      180
ttgaagggtgc aaagtactct attgggggta tcactagtgc aaacgataaa gctgtcgacc      240
taatagcaga agcaagagtt attaaagcag atcatattgg tgaatatgat tatgactttt      300
tcccatttaa aatagttaaa gaagcgatgt cattgaaaga gattgattht aaattaagaa      360
aataccttat tgataattat ggtctttacg gtgaaatgag tacagggaaa attaccgtca      420
aaaagaaata ctatggaaag tatacatttg aattggataa aaagttacaa gaagaccgta      480
tgtccgatgt tatcaatgtc      500
```

<210> 136

<211> 384

<212> DNA

<213> *Staphylococcus aureus*

<400> 136

```
gcgcaattac agtaacgacg caatcgggtca aagcagaaaa aatacaatca actaaagtth      60
acaaagtacc aacgcttaaa gcagagcgat tagcaatgat aaacataaca gcaggthcaa      120
attcagcgac aacacaagca gctaacacaa gacaagaacg cacgcctaaa ctcgaaaagg      180
```

caccaaatac taatgaggaa aaaacctcag cttccaaaat agaaaaaata tcacaaccta 240
aacaagaaga gcagaaatcg cttaatatat cagcaacgcc agcgcctaaa caagaacaat 300
cacaaacgac aaccgaatcc acaacgccga aaactaaagt gacaacacct ccatcaacaa 360
acacgccaca accaatgcaa tcta 384

<210> 137
<211> 270
<212> DNA
<213> Staphylococcus aureus

<400> 137
tttaaaagtt agttctttat tcgttgcaac ttgacaaca gcgacacttg tgagttctcc 60
agcagcaaac gcgttatctt caaaggctat ggacaatcat ccacaacaaa cgcagtcaag 120
caaacagcaa acacctaaga ttcaaaaagg cggtaacctt aaaccattag aacaacgtga 180
acacgcaaat gttatattac caaataacga tcgtcaccaa atcacagata caacgaatgg 240
tcattatgca cccgtaactt atattcaagt 270

<210> 138
<211> 556
<212> DNA
<213> Staphylococcus aureus

<400> 138
tttttatcgt aagccctttg ttgcttgcca caatcgctac agattttacc cctgttccct 60
tatcatctaa tcaaataatc aaaactgcaa aagcatctac aaacgataat ataaaggatt 120
tgctagactg gtatagtagt gggctctgaca cttttacaaa tagtgaagtt ttagataatt 180
ccttaggatac tatgcgtata aaaaacacag atggcagcat cagccttata atttttccga 240
gtccttatta tagccctgct tttaaaaaag gggaaaaagt tgacttaaac aaaaaagaa 300
ctaaaaaag ccaacatact agcgaaggaa cttatatcca tttccaaata agtggcggtta 360
caaatactga aaaattacct actccaatag aactacctt aaaagttaag gttcatggta 420
aagatagccc cttaaagtat tggccaaagt tcgataaaaa acaattagct atatcaactt 480
tagactttga aattcgctat cagctaactc aaatacatgg attatatcgt tcaagcgata 540
aaacgggtgg ttattg 556

<210> 139
<211> 532

<212> DNA

<213> Staphylococcus aureus

<400> 139

```
gaaagtattc tgtaggtact gcttcaatth tagtagggac aacattgatt tttgggttaa      60
gtgggtcatga agctaaagcg gcagaacata cgaatggaga attaaatcaa tcaaaaaatg      120
aaacgacagc cccaagttag aataaaacaa ctaaaaaagt tgatagtcgt caactaaaag      180
acaatacgca aactgcaact gcagatcagc ctaaagttag aatgagttag agtgcaacag      240
ttaaagaaac tagtagtaac atgcaatcac cacaaaacgc tacagctaat caatctacta      300
caaaaactag caatgtaaca acaaatgata aatcatcaac tacatatagt aatgaaactg      360
ataaaagtaa tttaacacaa gcaaaagatg tttcaactac acctaaaaca acgactatta      420
aaccaagaac tttaaatcgc atggcagtga atactgttgc agctccacaa caaggaacaa      480
atgttaatga taaagtacat ttttcaaata ttgacattgc gattgataaa gg              532
```

<210> 140

<211> 622

<212> DNA

<213> Staphylococcus aureus

<400> 140

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cgggcaaata aataaagatg taacagatat aaaaatatat caagttccta aagggttatac      60
attaaataaa ggatacgatg tgaataactaa agagcttaca gatgtaacaa atcaataactt      120
gcagaaaatt acatatggcg acaacaatag cgctgttatt gatttttgaa atgcagattc      180
tgcttatggt gtaatgggtt atacaaaatt ccaatatata aatagcgaaa gcccaacact      240
tgttcaaatg gctactttat cttcaacagg taataaatcc gtttctactg gcaatgcttt      300
aggatttact aataaccaa gtggcggagc tgggtcaagaa gtatataaaa ttggtaacta      360
cgtatgggaa gatactaata aaaacggtgt tcaagaatta ggagaaaaag gcgttggcaa      420
tgtaactgta actgtatttg ataataatac aaatacaaaa gtaggagaag cagttactaa      480
agaagatggg tcatacttga ttccaaactt acctaattga gattaccgtg tagaattttc      540
aaacttacca aaaggttatg aagtaacccc ttcaaaacaa ggtaataacg aagaattaga      600
ttcaaacggc ttatcttcag tt              622
```

<210> 141

<211> 892

<212> DNA

<213> Staphylococcus aureus

<400> 141
aaagttggcg atggttaaaga taatgtggca gcagcgcag acggttaaaga tattgaatat 60
gatacagagt ttacaattga caataaagtc aaaaaaggcg atacaatgac gattaattat 120
gataagaatg taattccttc ggatttaaca gataaaaatg atcctatcga tattactgat 180
ccatcaggag aggtcattgc taaaggaaca tttgataaag caactaagca aatcacatat 240
acatttacag actatgtaga taaatatgaa gatataaaat cacgcttaac tctatattcg 300
tatattgata aaaaaacagt tccaaatgag acaagtttga atttaacatt tgctacagca 360
ggtaaagaaa caagccaaaa tgtcactgtt gattatcaag atccaatggg ccatgggtgat 420
tcaaacattc aatctatctt taaaaatta gatgaagata agcaaactat tgaacaacaa 480
atztatgtta acccattgaa aaaatcagca accaacta aagttgatat agctggtagt 540
caagtagatg attatggaaa tattaaacta ggaaatggta gcaccattat tgacccaaat 600
acagaaataa aggtttataa agttaactct gatcaacaat tgcctcaaag taatagaatc 660
tatgatttta gtcaatacga agatgtaaca agtcaatttg ataataaaaa atcatttagt 720
aataatgtag caacattgga ttttgggtgat attaatcag cctatattat caaagttgtt 780
agtaaataa cacctacatc agatggcgaa ctagatattg cccaaggtac tagtatgaga 840
acaactgata aatatgggtta ttataattat gcaggatatt caaacttcat cg 892

<210> 142
<211> 747
<212> DNA
<213> Escherichia coli

<400> 142
gtttgggact tattgctctg gcggtgggta atgcatatgc aacacaattg ttggatgatt 60
atagtataat ttctatatg actgatgaag aatcgccgat tgaaatcaaa gataataatc 120
cgataagtaa tggagagtat ctaaccactg aagacgaaag ccatgctgtg aaagtggatg 180
acggtgtaac tggatatata aataatgcca gtgtgatgac tagtgggtgat ggatcttatg 240
gtatttctgt tgatagtcaa aacaaagtat tatatataag cgatagcgat attaagacct 300
ctggaagcgt atctgacaaa gaaaatggag ggataacagc cagcgcagta gtcagtgaat 360
ttgggtggcac catctttatg aatggtgata attcagtcga gtcgggtggg gcatattcag 420
cgggactttt aagccaggtt aatgattctg aaaagatggg aaataacacc cgtcttgaaa 480
ccacagataa aacgaacatt gttacctctg gggaaaatgc agtaggtgtt cttgcatgtt 540

caagtcctgg agagtctcga acatgtgtcg atgctgtaga tgatgaagtt agtgattcta 600
acagttacga agttatttagc cgtgctgatt taaaaatgaa tgggtggttcc ataacaacta 660
atggcattaa tagctatggt gcttatgcta atgggaaaaa agcatatatt aatttagatt 720
atgtggcact tgaaactgtg gctgatg 747

<210> 143
<211> 621
<212> DNA
<213> Escherichia coli

<400> 143
agcctggtga cgacttatct ggtggtgctg aacttcgcga ttttgccgag cctccagcag 60
tttaataaag tcctcgcgta cgaagtgcgt atgttgatga ccgacaaact gcaactggag 120
gacggcacgc agttggttgt gcctcccgtc ttccgtcggg agatctaccg tgagctgggg 180
atctctctct actccaacga ggctgccgaa gaggcaggtc tgcgttgggc gcaacactat 240
gaattcttaa gccatcagat ggcgagcaa ctgggcggcc cgacggaagt gcgcgttgag 300
gtcaacaaaa gttcgcctgt cgtctggctg aaaacctggc tgcgcgccc aa tatctgggta 360
cgcggtgccg tgaccgaaat tcattcaggc gatttctctc cgctgttccg ctatacgtg 420
gcgattatgc tattggcgat aggcggggcg tggtgtttaa ttcgtatcca gaaccgaccg 480
ttggtcgatc tcgaacacgc agccttgag gtgggtaaag ggattattcc gccgccgctg 540
cgtgagtatg gcgcttcgga ggtgcgttcc gttaccctg cctttaacca tatggcggtc 600
ggtgttaagc aactggcgga t 621

<210> 144
<211> 449
<212> DNA
<213> Escherichia coli

<400> 144
accacgacag gtctttatga tctgaaaacc gaaaatacct tgttaactac cgatgctgca 60
ttcgataaat tagggaatgg cgataaagtc accgttggtg gcgtagatta tacttacaac 120
gctaaatctg gtgattttac taccaccaa tctactgctg gtacgggtgt agacgccgcg 180
gcgcaggcta ctgattcagc taaaaaacgt gatgcgttag ctgccaccct tcatgctgat 240
gtgggtaaat ctgttaatgg ttcttacacc acaaaagatg gtactgtttc tttcgaaacg 300
gattcagcag gtaatatcac catcggtgga agccaggcat acgtagacga tgcaggcaac 360

ttgacgacta acaacgctgg tagcgagct aaagctgata tgaaagcgct gcttaaagcc 420
gcgagcgaag gtagtgacgg tgcctctct 449

<210> 145
<211> 704
<212> DNA
<213> Escherichia coli

<400> 145
atggaattgc gtctgttcaa ctatctggtc gagcgtaaag atctgattca gatcccggtg 60
tatccgttcg aacgcgaatg gacgcacttc accagcatga cttacattga tgagttttca 120
gagctgcatg gcaaagatgt tccggtgcgt gaagccctcg ccggacaagt gcccagcgca 180
ggcgtcggca cctgtttcag ccgccgcgcc gtgaccgcac tgtagctga cggtgacggt 240
attgctttcg acgtgcagag tcttactgaa gattacgaca ttggcttcg cctgaaagaa 300
aaaggatga cggaattttt tgtccgtttt ccggtggtgg acgaagccaa agaacgcgag 360
cagcgtaaatt ttttacagca cgcgcggaaca tcaaacatga tctgcgtgcg cgaatatttc 420
cccgatacct tttcgactgc ggttcgacaa aaatcccgct ggatcatcgg cattgttttc 480
caaggcttta aaaccataa atggacctcc agcctgacgc tgaactactt tctctggcgc 540
gaccgcaaag gggcaatcag taactttgtc agcttcctcg cgatgctggt gatgatccag 600
cttttgctgt tgctggcgta tgaaagttag tggcccgatg cctggcattt cttttctatt 660
ttcagcggca gcgcatggtt aatgaccctg ctgtggctaa actt 704

<210> 146
<211> 251
<212> DNA
<213> Escherichia coli

<400> 146
ataatcctcg tcatttgacg attatggaac tcgagggggc gcagctcccg cgcgtactgg 60
atgatcccaa agttgatgta gcgattatca gcaccactta cattcagcag accgggcttt 120
ctccggtgca cgacagcgta tttattgaag ataagaattc gccgtatgtg aatatttttg 180
tggcacggga agataataag aatgcagaaa acgtgaagga atttctgcaa tcttatcaat 240
cacccgaagt c 251

<210> 147
<211> 423

<212> DNA

<213> Escherichia coli

<400> 147

```

ctctgtccct cagttctacg acggtctctgg ccgctgccac gacggttaat ggtgggaccg      60
ttcactttaa aggggaagtt gttaacgccg cttgcgcagt tgatgcaggc tctgttgatc      120
aaaccgttca gttaggacag gttcgtaccg catcgtctggc acaggaagga gcaaccagtt      180
ctgctgtcgg ttttaacatt cagctgaatg attgcgatac caatgttgca tctaaagccg      240
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gttcagctgc gggtagcgca acaaacgttg gtgtgcagat cctggacaga acgggtgctg      360
cgctgacgct ggatggtgcg acatttagtt cagaaacaac cctgaataac ggaaccaata      420
cca                                                                                   423

```

<210> 148

<211> 768

<212> DNA

<213> Escherichia coli

<400> 148

```

gactcgttac agcgattgcg gcaactggcg caacaaaccg gctcgtgaa gtcacaaacc      60
gaacagaaag ttattaccac aacgaagaaa gctgtaccgg taaaacagac agtcacggca      120
cccgtcatac catccaatac agttttaact gccaaacccg tcattacaga gccggcaaca      180
accgtcatth ccattgagcc cgccaatcct gatgtggtct atattcccaa ctacaaccca      240
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catgacaatg atgattatca tcaccacgat ggcggtcatc gtgacggtaa tggctggcaa      480
cacaacggcg acaacatcaa tatcgacgtc aacaatttca accgtatcac cggtgagcat      540
cttactgata agaatatggc atggcggcac aatccaaact accgtaatgg tgtgccctat      600
catgatcagg atatggcaaa gcggtttcat caaacggatg tcaacggcgg aatgagcgcc      660
acgcaattac ctgccccaac gcgcgacagc cagcgtcagg cggcagcaaa tcagtttcag      720
caacgaacac acgccgcacc agtcattaca cgagataccc aacgtcag                                                                 768

```

<210> 149

<211> 788

<212> DNA

<213> Escherichia coli

<400> 149

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ctttacgacg gttctcccca ggactgaaag cccagtttgc cttcggcatg gtctttttgt      60
tcgttcagcc cgatgccagc gctgctgaca taagtgcgca gcaaataagg ggggtgatta      120
ttccgcaggc cttcagtcag gcgcttcagg acggcatgag cgtcccgtc tatattcatc      180
tcgccggtag ccagggtcgc caggacgac agcgaatcgg cagcgctttt atctggctgg      240
acgatggaca gctacgcac cggaaaatac agctggaaga gagtgaagat aacgccagt      300
tcagcgaaca aactcgacag cagctgatgg ctctggccaa cgccccgttc aatgaggccc      360
ttaccatccc cctgactgac aacgcgcagc tggatctcag cttgcgcaa ctgctgctgc      420
agctagtggg caagcgcgaa gcgctgggca ccgtactacg ctcacgtagc gaagacatcg      480
ggcagtccag tgtaaacacc ctcagcagta atctgagcta taacttgggc gtctataaca      540
accagttgcg taacggcggg agcaacacat ccagctatct gtcgctgaat aacgttactg      600
cactgcgcga acatcatgtg gtgctcgacg gctcgtgta cgggatcggg agcgggtaac      660
aggacagtga attatataaa gcgatgtatg aacgcgattt tgccggtcac cgatttgccg      720
gtggaatgct cgacacctgg aacttgcagt ccttagggcc gatgaccgcc atttcagcag      780
ggaagatt                                         788
```

<210> 150

<211> 750

<212> DNA

<213> Escherichia coli

<400> 150

```
ttgaaacttc ttactgcgcg attttttagca gcgagtcctc cggcgaagag tgctgttaat      60
aacgcctatg atgcattgat tattgaagct cgcaagggtg atactcagcc agctttgtca      120
tggtttgcac taaaatcagc actcagcaat aaccaaattg ctgactgggt acagattgcc      180
ttatgggccg ggcaagataa acaggttatt accgtttaca accgctaccg tcatcagcaa      240
ttaccagcgc gtggttatgc agctgtcgcc gtcgcttata gtaacctgca acaatggcaa      300
aactcgctta cactgtggca aaaggcgtc tctctggagc cgcaaaataa ggattatcaa      360
cggggacaaa ttttaacctt ggcagatgct ggtcactatg atactgcgct ggttaaactt      420
aagcagctta actctggagc accggacaaa gccaatctac tcgcagaagc ctatatctat      480
aaactggcgg ggcgtcatca ggatgaatta cgggcgatga cagagtcatt acctgaaaat      540
```

gcactctacgc aacaatatcc cacagaatac gtgcaggcat tacgtaataa tcaacttgc 600
gccgcgattg acgatgccaa tttaacgccga gatattcgcg ctgatattca tgccgaactg 660
gtcagactgt cgtttatgcc tacgcgcagt gaaagtgaac gttatgccat tgccgatcgc 720
gccctcgccc aatacgcctgc attagaaatt 750

<210> 151
<211> 733
<212> DNA
<213> Escherichia coli

<400> 151
atagcagggc tgtttgatc atctctaagt tatgcagaaa acacggagat cccttcttat 60
gaagaaggga tctcgtcttt tgatgttgaa gccactctgc aaccagatgg ggtgctcgac 120
atcaaagaaa atattcatctt tcaggcgcga aatcagcaga ttaagcacgg cttttatcgt 180
gatttaccac gactatggat gcagcctgat ggggacgctg cactgctgaa ctatcatatt 240
gttggcgtca cccgtgatgg tattcctgaa ccctggcacc ttgactggca tatcgggtta 300
atgagtattg tcgtgggcga taaacaacgt ttcttgctc aaggcgacta tcattatcaa 360
attcattatc aggttaaaaa tgctttcctg cgtgaggggg attctgatct gctaactctg 420
aacgtgaccg gtaaccactg gccgtttgaa atttataaga cccgtttttc tctccagttc 480
tctaataattg cgggtaatcc atttagcgaa atcgatcttt ttaccggaga agagggcgac 540
acatatcgta atggccgcct ccttgaggac ggaagaattg aatcccgcga tccgttttat 600
cgtgaagatt tcacggtcct ctaccgctgg cctcacgctt tacttagcaa tgctcggt 660
ccgcaaacga cgaatatctt cagccatctt cttttaccct ccacgtcacc gttgttaatt 720
tggtttccgt gtc 733

<210> 152
<211> 756
<212> DNA
<213> Escherichia coli

<400> 152
tattgtcacc gcgcagagtc tcacgatgcg ggcgatatca gctttagcga tatctttcgt 60
ggcccggctt ccatctttgg cggcattgag tatcaaacgc cgtggaatcc cctgcgtctg 120
aaactcgaat acgatggaaa caattaccag aatgatctcg ctggcaaact gcctcaggca 180
agccatttca acgtcggcgc agtttatcgc gctgccagct gggcagatct caacctgagt 240

| | |
|---|-----|
| tatgaacgcg gtaacacggt gatgtttggc ttcacgttac ggaccaatth caacgatctg | 300 |
| cgccctgccc tgcgcgatac gccaaaaccg gcatatcaac ctgcgcctga atctgaagga | 360 |
| ttgcagtaca ccacggtagc aaaccaactt accgcctga agtataacgc gggctttgac | 420 |
| gcgccagaaa ttcagctacg cgataagaca ctgtatatgt ctggtcagca atacaaatac | 480 |
| cgtgactctc gtgaagcggg cgatcgtgcc aaccggattc tgggaataa cctgccgcaa | 540 |
| ggcgttgaga agattagcgt gacgcaaaag cgcgagcata tggcgatggg gactaccgaa | 600 |
| accgacgtag ccagcctgcg caaacagctg gcaggtacag cgctgggtca atcagagcca | 660 |
| ctgcaacaac aacgtgttga agctgaagat ctttctgcct ttggtcgggg ctaccgtatt | 720 |
| cgtgaagatc gcttttagcta ctctttcaac ccaaca | 756 |

<210> 153
 <211> 735
 <212> DNA
 <213> Escherichia coli

| | |
|---|-----|
| <400> 153 | |
| gaataccaaa gcagatcgtc tcgctgaatt aaaaatccgt tcgccctcaa ttcaactgat | 60 |
| aaaatttggc gctattgggt tgaatgcaat tatcttttcc ccctgctga tagctgctga | 120 |
| tacaggaagt caatatggca ccaatattac tattaatgat ggtgacagaa ttacaggaga | 180 |
| taccgccgat ccacaggaa acctctatgg tgtaatgacc ccagcaggaa acacgcctgg | 240 |
| caatatcaac ctgggtaatg atgtcacctg caatgtcaac gacgcctctg gatatgcaaa | 300 |
| aggaatcatt attcaggga aaaacagctc cctgacagct aaccgactca cagtagatgt | 360 |
| tgttggtcaa acctctgcca tcggcattaa cttaattggg gactataccc atgtgactt | 420 |
| aggcacaggc agcaccatta agagtaacga tgacggcatc attattgggc atagctcaac | 480 |
| actaacagcc actcaattca ccattgaaaa ctggaacggg ataggcctaa ccatcaatga | 540 |
| ctatggcacc agtgtcgatc ttggaagcgg aagtaaaatc acgaccgatg gaagtacagg | 600 |
| tgtttatatc ggtggtctca acggcaataa cgccaatggg gctgcgcgtt ttacggctac | 660 |
| agacctgaca atcgatgttc agggctacag cgccatgggg ataaacgtac agaaaaactc | 720 |
| tgttgtcgat ctgg | 735 |

<210> 154
 <211> 509
 <212> DNA

<213> Escherichia coli

<400> 154

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ctaactcatt gtggtggagc ccaaacatga ttactcatgg tttttatgcc cggacccggc      60
acaagcataa gctaaaaaaa acatttatta tgcttagtgc tggtttagga ttgttttttt      120
atgttaatca gaattcattt gcaaatggtg aaaattattt taaattgggt tcggattcaa      180
aactgttaac tcataatagc tatcagaatc gcctttttta tacgttgaaa acaggtgaaa      240
ctgttgccga tctttctaaa tcgcaagata ttaattttatc gacgatttgg tcgttgaata      300
agcatttata cagttctgaa agcgaaatga tgaaggccga gcctggtcag cagatcattt      360
tgccactcaa aaaacttccc tttgaataca gtgccttacc acttttaggt tcggcacctc      420
ttgttgctgc aggtggtgtc gctggtcata caaataaaact gactaaaatg tccccggacg      480
tgaccaaaag caacatgacc gatgacaag                                     509

```

<210> 155

<211> 338

<212> DNA

<213> Escherichia coli

<400> 155

```

ggcgttacta tcctctctat gtgcacacgg agctcctcag tctattacag aactatgttc      60
ggaatatcac aacacacaaa tatatacgat aaatgacaag atactatcat atacggaatc      120
gatggcaggc aaaagagaaa tggttatcat tacattttaag agcggcgcaa catttcaggt      180
cgaagtcccg ggcagtcaac atatagactc ccaaaaaaaaa gccattgaaa ggatgaagga      240
cacattaaga atcacatatc tgaccgagac caaaattgat aaattatgtg tatggaataa      300
taaaaccccc aattcaattg cggcaatcag tatggaaa                                     338

```

<210> 156

<211> 500

<212> DNA

<213> Escherichia coli

<400> 156

```

tttgttgtaa ttggtacttc attcctgaaa atttctattg tactggggat attgaagaac      60
gcattaggca ttcaacaggc accaccaaac atggcgctaa catcagtgtc ttgatactg      120
acaatgttta ttatgtctcc gataatatta cagataaatg ataatatattc tcaggaacca      180
atcaattata ccgactctga tttttttcaa aaagttgatg agaaaatatt atcaccatat      240
cgcggtatatt tagaaaaaaa tacagagaaa gacaatgtag agttttttga acgtgcagct      300

```

caaaaaaaaaat tgggtaaatga aactatctta aaaaaagact ctctatztat actggtaccg 360
gctttcacga tggggcagct tgaagctgca ttcaagatag gttttttgct ctatttacct 420
tttattgcga tagatttgat catttccaat atcttattgg ccttgggtat gatgatggta 480
tcgccagtaa caatttcgat 500

<210> 157
<211> 503
<212> DNA
<213> *Escherichia coli*

<400> 157
ttacgcttcc gatcatagta gagaactata cattttcgga aaaattgcc a tctggaatct 60
ttcagttgac aggaatagtg ctaaaagaaa taagtattgg ttttttcatt gggttatcat 120
ttactattct tttttgggca atagatgcgg ctgggcagat tattgatact ctaagaggtt 180
caacaatata ttcaattttt aaccgcgtca taagtattc atcttctata actggcggtta 240
ttttgtacca atttatctct gtgatctttg ttattcatgg tgggatacaa agcattctgg 300
ataagctata tttatcctac gagatattac cattacaagc cgatattgca ttcaatcgtg 360
ctttaataga ttttttgttt tctctatggg attcatttat taaactgatg ttatcatttt 420
cagttcccat gattatcggg atattcttat gtgatatggg gtttgggttt cttacaaaaa 480
cagcgcctca actaaacgta ttc 503

<210> 158
<211> 617
<212> DNA
<213> *Escherichia coli*

<400> 158
aagtgaagag gtaatggctg cagtgcagtc attaatctta ttttcatttt tttctttata 60
tggcatgagt ttttttgttg atatagttgg gttagttaat acgacaatag actcgctaaa 120
tagaccgttt ttgtatgcc a ttcgagaaat attaggtgcg gtgttaaata tatttttatt 180
atataatttg ccaatttctt tgattgtctt tgttggaaact gttacgactg gtgtatcaca 240
aataggattc atctttgcgg ttgaaaaaat aaaaccatcg gtcagaaga ttagtgtaaa 300
aaataacctg aaaaatatat tttctgtaaa gagcattttt gagctactta aatcagtatt 360
taagttagtg ataattgttc tcatttttta ttttatgggg cattcatatg caaatgagtt 420
tgctaatttc acaggactga acgcatatca agctcttgtc gttgttgcc tttttgtttt 480

tcttttatgg aaaggcgtgc tattcggata tctactcttt tcagtatttg atttctggtt 540
ccagaagcat gagggactga agaaaatgaa aatgagtaaa gatgagggtga aacgagaagc 600
caaggatact gatggta 617

<210> 159
<211> 740
<212> DNA
<213> Escherichia coli

<400> 159
gatggtgact ctattgcagg attaccaaca aaaacaattg gcgcaaagct atcagattca 60
gcaggccgtt tttgagagcc agaataaagc tattgaggaa aaaaaagccg cggcaaccgc 120
tgctttggtt ggcgggatta tttcatcagc attggggatc ttaggttctt ttgcagcaat 180
gaacaacgcg gctaaagggg ctggtgagat tgctgaaaaa gcaagctctg catcttcaaa 240
ggctgctggt gcggcttctg aggttgcaaa taaagctctg gtcaaggcta cggaaagtgt 300
tgctgatgtc gcagaggagg catccagtgc gatgcagaaa gcgatggcca caacaacgaa 360
agcagccagc cgtgcactctg gcgttgcaaa tgatgttgcg aaagccactg actttgctga 420
agatcttgca gacgccgcg agaagacaag cagaatcaat aagttgttga attccgtaga 480
taaactgacc aataccacag catttggtgc cgtgaccagt cttgctgaag gtacgaaaac 540
gttgccaaca acaatatctg agtccgtcaa atcgactcat gaggttaatg aacaacgtgc 600
gaagtcgctg gaaaacttcc agcaggggaa tctggagctg tataaacaag acgttcgcag 660
aacgcaggat gatatcacga ctgctctgcg tgatataacg tccgctgtcc gcgatctcct 720
tgagggccag aatcgtatgg 740

<210> 160
<211> 717
<212> DNA
<213> Escherichia coli

<400> 160
tgtttgaggt cactttctgg tggcgtgatc cccaagggtc tgaagaatac tcgacgataa 60
agcgcgtatg ggtctacatc actggtgtga ccgatcacca tcagaacagc cagccccagt 120
cgatgcagcg aattgcaggc actaacgtct ggcagtggac gacacaactc aatgccaaact 180
ggcgcggcag ctactgcttt attcccaccg aacgcgatga cattttttct gtaccatccc 240
ccgatcgctc cgaattgcgc gaaggctggc gaaaactatt accccaggcg atagccgatc 300

cgctgaacct acaaagctgg aaaggcgggc gagggcacgc tgtttctgca ctcgaaatgc 360
 cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc gccagaaata cctgccaaag 420
 aaattatctg gaaaagtga aaggttga aagtcacggcg tgtatggatt tttaccaccg 480
 gcgatgcaac agcagaagaa cgcccgctgg cagttttgct cgatggcgaa ttttgggcgc 540
 aaagtatgcc cgtctggcca gtgctgactt cgctgacca tcgtcagcaa cttcctcccg 600
 ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg cgcccacgaa ctgccgtgta 660
 atgcggatth ctggctcgca gtacagcaag agttattacc cctggtgaaa gctattg 717

<210> 161
 <211> 379
 <212> DNA
 <213> Escherichia coli

<400> 161
 tgtttctgca ctcgaaatgc cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc 60
 gccagaaata cctgccaaag aaattatctg gaaaagtga aagtcacggcg 120
 tgtatggatt tttaccaccg gcgatgcaac agcagaagaa cgcccgctgg cagttttgct 180
 cgatggcgaa ttttgggcgc aaagtatgcc cgtctggcca gtgctgactt cgctgacca 240
 tcgtcagcaa cttcctcccg ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg 300
 cgcccacgaa ctgccgtgta atgcggatth ctggctcgca gtacagcaag agttattacc 360
 cctggtgaaa gctattgcc 379

<210> 162
 <211> 402
 <212> DNA
 <213> Escherichia coli

<400> 162
 tatgctgctc caactattcc tcaggggcag ggtaaagtaa cttttaacgg aactgttggt 60
 actgctccat gcggcatttc tcagaaatca gctgatcagt ctattgattt tgggcagctt 120
 tcaaaaagct tccttgcggc aggaggtgta tccaaaccaa tgaatttaga tattgaattg 180
 gtttaattgtg atatcacttc atttaagggg gggggaggaa gccaggcagc aaaaaaggg 240
 actgtgaagc tggcttttag tggccaagg gtttctggtc ataagagga gttagatacc 300
 agcgggggga caggtactgc aattgcagtt caggccgcag gtaaaaacgt ttctttcgat 360
 ggcacagaag gtgatgctaa taccctgaaa gatggagata at 402

<210> 163
<211> 724
<212> DNA
<213> Escherichia coli

<400> 163
cttggaatg ttggtaaagc tgtttcgcaa tatattctgg ctcagagaat ggcacagggg 60
ttatcgacaa cagctgcaag tgcgggtctg atcacatcgg ctgttatgct ggctatcagt 120
cctctttctt tcttggtgc tgcagataaa tttgagcgag ctaagcagct tgaatcatat 180
tctgaacgat ttaaaaaatt gaattatgaa ggggatgctt tactcgcagc ctttcataaa 240
gaaaccggag ctatagatgc agccctgaca acaataaata ctgtcctgag ttctgtatct 300
gcgggagtta gtgcagcctc cagtgcattc ctcatagggg ccccgataag catgctggtg 360
agtgcattaa ccggtacgat atctggcatt ctggaagcat caaacaggc tatgtttgag 420
cacgttgtag agaaattcgc tgctcggatc aatgaatggg aaaaggagca tggcaaaaat 480
tattttgaga atggatatga cgcaagacat gctgcgtttt tagaagactc tctgtctttg 540
cttgctgatt tttctcgtca gcatgcagta gaaagagcag tcgcaataac ccagcaacat 600
tgggatgaga agatcgggtga acttgtaggc ataaccgta atgctgatcg cagttagagt 660
ggtaaggcat atattaatta tctggaaaat ggagggcttt tagaggctca accgaaggag 720
ttaa 724

<210> 164
<211> 618
<212> DNA
<213> Escherichia coli

<400> 164
tcaatgctga aactataagg catcagtata atacccacac acaagatttt ggggtgactg 60
aatggttact ggcagcgaag tctattggct taaaagcaaa atatgtagaa aaacattttt 120
ccagattgtc aataatttct ttacctgcgt tgatatggcg ggatgacggg aagcattata 180
tattgtctcg tattactaaa gattcatcac gctatcttgt ttatgatcca gaacaacatc 240
agtcactaac ttttagtcgg gatgagtttg aaaaactgta tcagggaataa gtcattctgg 300
ttacgtcaag agcaacagta gtcggagagt tagctaaatt tgatttttct tggtttatcc 360
cctctgttgt gaaatacagg aggattttac ttgagggtgt aactgtttct gcttttatcc 420
agtttcttgc gttaataaca cctctttttt ttcagggtgt aatggataag gttttagttc 480

accgggggtt ttcaacgtta aatattatca caatagcatt tattatagtg atactttttg 540
 aagtgatatt aaccggagcc agaacttata ttttctctca tactacaagt cgtattgacg 600
 tcgaactggg tgctaagt 618

<210> 165
 <211> 768
 <212> DNA
 <213> Escherichia coli

<400> 165
 catcaggcag ttatcctgtc gactttacca ctctctcccg gcttattatt gataagctcc 60
 ggcatacaact ttttctgcc a gttccctct gcgaaacttt ccaccaacgc gtgctggaaa 120
 gctacgccca tacgcaacag acaattgatg cccgccatga ctgggccatc ctgcgtgaaa 180
 aagcgttgaa ttttgccgag gctgagcagg cactgctgac aggacacgct ttccaccctg 240
 cacctaagtc tcatgaaccg tttaaccgcc aggaagctga acgatacctg cctgacatgg 300
 cacctcactt cccgctgcgg tggttttcgg tggataaaac gcaaactcgt ggtgaaagtc 360
 tgcactctaa cttcaacag cggttgacgc gatttgccgc agaaaatgcg cccagttac 420
 tcaacgaatt aagtgacaat caatggctgt tcccgtgcg cccgtggcag ggagaatata 480
 ttttccagca agtgtggtgc caggcacttt ttgctaaagg acttatcaga gacttaggcg 540
 aggcgggcac gtcgtggctg ccgaccacct cttcccgtc cctctactgt gctaccagcc 600
 gcgatatgat caagttctcc ctgagcgttc ggctgaccaa ctccgtccgt actctgtctg 660
 tgaaagaggt ggagcgagga atgcgcctgg cagctctggc gcaaaccgac ggctggcaga 720
 tgctacaggc ccgcttcctt actttccggg taatgcagga ggacgact 768

<210> 166
 <211> 501
 <212> DNA
 <213> Escherichia coli

<400> 166
 ttcacagcgg atatggactg cgctgtgaaa aactcgacaa gcctctgaat cttggctggg 60
 ggctggacaa tagcgcggtg ttgactggc ccggggagct gccaacaggg tggctgtgcg 120
 acgcgctgga tcagatatct atcgccgcac cacaactttc agcagtgggt cttccctggg 180
 ccgaatggtg tgaggagcca caggcgtga cgcttttcgg acaggtacaa agcgacatta 240
 tccatcgctc cgctttctgg cagttaccgt tatggctgag ttctccggca aaccgggcct 300

ccggtgaaat ggtttttgat gcagagcgtg agatttatTTT cccgcagcgc cccccccgTc 360
cgcagggtga agttttatcgt cgttacgac caccgattcg caggatgctg agtttccgca 420
ttgccgatcc cgtttctgat gcagaacgTt tcaTcgctg gatgaacgat ccgcgcgttg 480
agtattttctg ggagcaaagt g 501

<210> 167
<211> 721
<212> DNA
<213> Escherichia coli

<400> 167
agactgggat ttggtcaacc gccgcctggt ggcaaaaatg ttgtctgagc tggagtatga 60
gcaggttttc caccgcgaat ctcaaggcga tgaccgctac tgcattaacc tgccgggagc 120
acaatggcgc ttcatcgctg aacgtggtat ctggggctgg ctctggattg atgtctaaac 180
tctgcgctgc gcggacgagc cagtactggc tcagacgctg ctgatgcagc taaagcaggt 240
actgtcaatg agcgatgcaa ccgttgctga gcatatgcag gatttgatg ccacgtgct 300
ggcgacctg caactactga aagcccgtcg cgggctgagc gccagtgacc tgattaatct 360
taatgccgac cgctgcaat gcctgctgag cggTcatcct aaattcgTtt ttaataaaagg 420
tcgccgtggc tggggtaaag aggcgctgga acgatatgcg ccagagtatg ccaacacctt 480
cagactgcac tggctggcgg taaaacgtga acatatgac tggcgctgtg ataacgagat 540
ggatattcat cagttgttga cggccgcaat ggatccgcag gagtttgccc gcttcagtca 600
ggTctggcag gaaaacgac tggatcataa ctggctgccg ctgccggtac atccgtggca 660
gtggcaggaa aaaatcgcta ccgacttcat cgctgatttt ggCGaaggca ggatggtgTc 720
t 721

<210> 168
<211> 719
<212> DNA
<213> Escherichia coli

<400> 168
ggagtatatT gcgtgggtag tattcccca aaaggttatg accaaaaatg gatatccctt 60
atttattgag gttcataata aaggtagctg gagtgaggag aatactggtg acaatgacag 120
ctatTTTTTT ctcaaggggt ataagtggga tgagcgggcc tttgatgcag gtaatttTgtg 180
tcagaaacca ggagaaacaa cccgtctgac tgagaaattt gacgatatta tttttaaagt 240

cgccctacct gcagatcttc ctttagggga ttattctggt acaattccat acacttccgg 300
catgcagcgt catttcgcga gttacttggg ggcccgtttt aaaatcccat acaatgtggc 360
caaaactctc ccaagagaga atgaaatggt attcttattt aagaatatcg gcggatgccg 420
tccttctgca cagtctctgg aaataaagca tggatgatctg tctattaata gcgctaataa 480
tcattatgcg gctcagactc tttctgtgtc ttgcgatgtg cctgcaaata ttcgttttat 540
gctgttaaga aatacaactc cgacatacag ccatggtaag aaattttcgg ttggtctggg 600
gcatggctgg gactccattg tttcggttaa cggggtggac acaggagaga caacgatgag 660
atggtacaaa gcaggtacac aaaacctgac catcggcagt cgctctatg gtgaatctt 719

<210> 169
<211> 561
<212> DNA
<213> Escherichia coli

<400> 169
aaatgaatgt ctggactcaa cgtggatttc atcaaaagga aactatattc agaagtttga 60
aaataaattt gcggaacaaa accatgtgca atatgcaact actgtaagta atggaacggt 120
tgctcttcat ttagctttgt tagcgttagg tatatcgga ggagatgaag ttattgttcc 180
aacactgaca tatatagcat cagttaatgc tataaaatac acaggagcca ccccatttt 240
cgttgattca gataatgaaa cttggcaaat gtctgttagt gacatagaac aaaaaatcac 300
taataaaact aaagctatta tgtgtgtcca ttatacggga catccatgtg atatggaaca 360
aattgtagaa ctggccaaaa gtagaaattt gtttgaatt gaagattgag ctgaagcctt 420
tggttctaaa tataaaggta aatatgtggg aacatttgga gatatttcta cttttagctt 480
ttttggaaat aaaactatta ctacaggtga aggtggaatg gttgtcacga atgacaaaac 540
actttatgac cgttgtttac a 561

<210> 170
<211> 750
<212> DNA
<213> Escherichia coli

<400> 170
agcagcatca ggttctgagc tgcattgcga atcaaatgac aacggaagat attctggaga 60
aactgaaaat atcgctaaaa acgctctact gccataaaca caatatcatg atgacctca 120
atcttaagcg gatcaatgag ctggtacgcc atcagcatat taattatctg gtgtgaacga 180

ttgaacaata taaagaggcc cagcaacagc cagacctccc gttaattata cgttatgcag 240
taacgccttc cggtatcaac gaagcaattht gcttacgcca ttgcgcttgc tcctgttcac 300
cttctgtacg ttgaccataa agttgcgcta tctgcgtacc atcatgggca aacaattcca 360
gactgggttac gtgaccatcg ctggtcgggt tacgggtaac ccaggcttca gcaatgctct 420
cttctaatag atgaagggtta aacgtcgggt tgaaaatatt cagccaacct ttcattggca 480
ccactttttc taccacaccg gtgaaaatct gtacgcagcc acggttgcca acaaacacca 540
tgatttcatt gccatcctgc tgtgcagatt caagaatttg cgccaacgca ctgttgata 600
ctttgcaggc caaatcgtct gccaccagat tgaacgcctg ttggcgcgtc aggttgtggc 660
gcttgagcaa cgtaaaaaac tgatgaacgt cggtcacgc ccgccactct tgctcgacca 720
cactggcatc ggctcgcgtt tgaacaactg 750

<210> 171
<211> 616
<212> DNA
<213> Escherichia coli

<400> 171
ttcttcggta tcctattccc gggagtttat gatagacttt tcgaccaaac aaagttatgt 60
ctcttcgta aatagtatac ggacagagat atcgaccctt cttgaacata tatctcaggg 120
gaccacatcg gtgtctgta ttaaccacac cccaccgggc agttattttg ctgtggatat 180
acgagggctt gatgtctatc aggcgcgttt tgaccatctt cgtctgatta ttgagcaaaa 240
taattttatat gtggctgggt tcgttaatac ggcaacaaat actttctacc gtttttcaga 300
ttttacacat atatcagtgc ccgggtgtgac aacggtttcc atgacaacgg acagcagtta 360
taccactctg caacgtgtcg cagcgttgga acgttccgga atgcaaatca gtcgtcactc 420
actggtttca tcatatctgg cgttaatgga gttcagtggt aatacaatga ccagagatgc 480
atccagagca gttctgcgtt ttgtcactgt cacagcagaa gccttacgct tcaggcagat 540
acagggagaa tttcgtcagg cactgtctga aactgctcct gtgtatacga tgacaccgga 600
agaagtggac ctca 616

<210> 172
<211> 613
<212> DNA
<213> Escherichia coli

<400> 172
 aaatggcgac aaattatacc gtgctgactc tagaccccca gatgaaataa aacgttccgg 60
 aggtcttatg cccagagggc ataatgagta cttcgataga ggaactcaaa tgaatattaa 120
 tctttatgat cacgcgagag gaacacaaac cggctttgtc agatatgatg acggatatgt 180
 ttccacttct cttagtttga gaagtgtctc cttagcagga cagtctatat tadcaggata 240
 ttccacttac tatatatatg ttatagcgac agcaccaa atgtttaatg ttaatgatgt 300
 attaggcgta tacagccctc acccatatga acaggagggt tctgcgttag gtggaatacc 360
 atattctcag atatatggat ggtatcgtgt taatttttgt gtgattgatg aacgattaca 420
 tcgtaacagg gaatatagag accggtatta cagaaatctg aatatagctc cggcagagga 480
 tggttacaga ttagcagggt tcccaccgga tcaccaagct tggagagaag aacctggat 540
 tcatcatgca ccacaagggt gtggagattc atcaagaaca attacagggtg atacttgtaa 600
 tgaggagacc cag 613

<210> 173
 <211> 227
 <212> DNA
 <213> Escherichia coli

<400> 173
 aagaagatgt ttatggcgggt tttatttgca ttagtttctg ttaatgcaat ggcggcggat 60
 tgcgcataaag gtaaaattga gttttccaag tataatgaga atgatacatt cacagtaaaa 120
 gtggccggaa aagagtactg gaccagtcgc tggaatctgc aaccgttact gcaaagtgtc 180
 cagttgacag gaatgactgt cacaatcaaa tccagtacct gtgaatc 227

<210> 174
 <211> 260
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 174
 ccactttttc tactttctaaa acttcagcaa gtgtttcacg taacttgcta gaacgagtaa 60
 tttttatatc gtccttacca tcatttttgt ctatggtaaa tatattcata ttattttctt 120
 ctttaaatat tgctgcatgt actgtaaaact tatcgtagtc aatcatagtt agtactgtat 180
 ctaggtgcat aaatgtgcgt gtattaggta tttcaatagc tacgattttt ttaaaacttg 240
 tgtttgcac tttgaaaata 260

<210> 175
<211> 422
<212> DNA
<213> Staphylococcus epidermidis

<400> 175
ttgataacaa acaaattctg ctatttcatt tgaagaagtc aaaatcatca aagtatcggt 60
acctccaata gttcctaata tttctttcat ttgtaattga tctatgtaat aacttatact 120
ttgagcaaag ccaggagatg tttttattaa gacatagtta tttagcgta taaattcaat 180
aatctcatca ctaaataattt ctaattgttt ttttgcaactt aattgatttg tttgatttat 240
tttcttgtaa atatactttt tattttcaac agggattttg taaatttcta attcttgtaa 300
gtcacgagaa atagttgtca agctatagta aactccaaaa tgtcttgcca tgtaatccac 360
tatttgttgt tttttattaa actgattctg ttgtataaca gttaagataa gatttaaacg 420
tt 422

<210> 176
<211> 322
<212> DNA
<213> Staphylococcus epidermidis

<400> 176
taacactgaa cccaatgac ctacaatatg ttctaatact tgtgccattg atggattagc 60
aagttttgaa atttggttct gctgaatgac accttgggct agtacagtca ttaagaaata 120
aatgactagc acagaaatca aaccaataac ggtagcagtt cctacatcct ttttagactt 180
tgcacgtcca gaaaagacaa cggctccttc aatccctgtg aatacccata cagttactaa 240
catagtactt tttacttgtg ccattgtatc tccccaacta aaaacgcaa cacttccact 300
agtcatacca taaaaaccgg at 322

<210> 177
<211> 733
<212> DNA
<213> Staphylococcus epidermidis

<400> 177
cctcaaacaa gcagaaaaag ctaaaagcga agttacacaa tcaactacaa atgtatctgg 60
tacacaaaca tatcaagacc ctaccaagt tcaacctaaa caagacacac aaagtactac 120
atatgatgca tcattagatg aatgagtac ttataatgaa atttcatcaa atcaaaagca 180
acaatcttta tcaacagatg atgcgaatca aatcaaacg aattctgtta caaaaaatca 240

acaagaagaa acaaatgatt tgacacaaga agataaaaca tccactgata caaatcaatt 300
acaggagaca caatctgtag caaaagaaaa tgagaaagat ttaggagcta acgcaaataa 360
tgaacaacaa gacaagaaga tgactgcaag tcaaccttcc gaaaatcaag caattgaaac 420
tcaaactgct tctaattgata atgaaagcca aaaaaaaagt cagcaagtaa cttctgaaca 480
aaatgaaact gctacaccta aagtatcaaa tacaacgcga tctggttata attttgatta 540
cgatgatgaa gacgatgata gctcaacaga ccatttagag cctatctcat taaacaatgt 600
gaatgctaca tctaacaaca ctacttcata taaatataaa gaaccagctc aacgtgtaac 660
aactaatact gtaaaaaaag aaacggcatc taatcaagcg actatagata caaagcaatt 720
caccccattht agt 733

<210> 178
<211> 507
<212> DNA
<213> Staphylococcus epidermidis

<400> 178
cttagggaaa aagatgggta gtaatgttaa agattctaaa attacaccga ataaaaataag 60
tttattttacc ggttcttttag ttactaatga aataactacg atagtacaat ataaaaatat 120
ggagagtatt ttttttcgct ttacaagacg tctaggtata ggttgtttct tagttgctgc 180
aggtgctgat aaaaaggtaa taattaatcc gactaatgcc atagataaaa gaacaaaata 240
gttaatatct aactttatta ttaagtatgg aaagataata aagaaaatta tgttctgaat 300
atgacataac aatgacgaat ttgcatgctg accgtgtgca tgtctcctaa ttaaaaaata 360
acttaaatga gttaaaagtg tgtaaaagaa agtatgaaag attattgcta gcccatcac 420
aactatagac ttttcaatat ttatcgctag tacctgcac cctaaacgaa tttttagaaa 480
ctgtatgtga tctaagttat ttttacg 507

<210> 179
<211> 512
<212> DNA
<213> Staphylococcus epidermidis

<400> 179
cctcgcatat cagtttgtga caccatataa agtaaaataa atgatatgaa aagtactatt 60
gttattatca ataagtatct tttattgagt gacaagtagg atacttttaa tttattgaac 120
aatagttgag ttaaataagc aataattaga gttatgatta caaaagaggt aaaatgtatt 180

aactgtaaag caaatTTaaa cggaatataa tcttttatag tcaaatgtat gtatacagtt 240
 atgaaattag ttatatataa gatcatagtg gtgaataata caactaatat tgaataaagc 300
 tttatttttg tataaaagaa aatggtgatt attataacca aaactattaa tgctttactt 360
 tgccaaaagt aatacattat tgcagaaggg attacaatcg taaaaacgat tatgtaatcc 420
 ctaaaattaa atttcatatt aatgataact ttagtaacct aaatcattaa aaagatttgt 480
 aggctgcaa acggaaatag attaatatca tc 512

<210> 180
 <211> 534
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 180
 atgaagcaca accaccatac cttgtaaatt ttttttagat ttagttaaaa tggggataca 60
 agatacatcg aaatatTTtag tatgtacggt attaatagca acttctaatt gttcatagat 120
 aactttttca gttctaaaac tttcaataat taatttttca atactatcat ctatgaaacc 180
 aatgtaactt ttatttttca ccatttgatc agggttaaac acctgataat aagcatgatt 240
 agcaactaca atttctccat gtttatcaat catcagtact gaactcggta tattttctaa 300
 ggtagtTTTT aatctattgg attgaatttt ttgactattg ttttaattttt gcaatcgtcg 360
 tgctaagtca tttgtagtca caaataatgc ctagtttcc ttcacattac tttctggaac 420
 acgaacatgg taatatccat ctgctagaag tgatgtagca taagttaactt cattgatagg 480
 tctaatatat gttcgattga tacttctact tgctaaatag accgtaaata atac 534

<210> 181
 <211> 286
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 181
 ctaagcacia gaaaggctca atattagcta tcataggttt gctaattgta tttgttgta 60
 caggttttat cttcttttca atgatttcag atcaaatatt tttcaaaccat gtcaaaccag 120
 ttgaaaagggt tgaaaaatta gataaaactt tagataaagc atctaaaaag caaatacaca 180
 attatacgag ccaacaagta tctaacaaag caaatacagc ttggcgtgat gcgtctggta 240
 cagaaattaa agaagctatg gatagtagta aattcataga tgatga 286

<210> 182

<211> 381
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 182
acgacgaatg attcataagg tttaatatgg tctaaattta tatcatttaa gtgataatta 60
tgcaatttta tatctacaga tgaaatatct aattcaaaag gtaggttttag ttctgatact 120
tcatttgatga gattggctac aattaatata gtattgtttt taaatgtgcg tgtatatgca 180
aaaacctgct tattttcagc atcgaccata ttaaacttac cgtagatgta aatcaaatca 240
gatttttttta gttgaattaa cgctttataa taagaaagta tcgaaaactt atcatttagt 300
tgttggttta cattaatctt tgtatagtta ggggtttacat gaaaccatgg cttaccagta 360
gtgaatccag cattgataga a 381

<210> 183
<211> 272
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 183
ttaaaccatt aggaaatcgt gtgattattg agaagaaaga gcaagaacaa gcagctaaaa 60
gtggcatcgt tttaacagat agcgctaaag aaaaatcaaa tgaagggtg atcattgcag 120
ttggacaagg tcgtttatta gacaatggca cacaagttgc tcctcaagtc agtgaagggtg 180
acacaatcgt cttccaacaa tatgcaggta ctgaagtaaa acgtggcgcc caaacatatt 240
taattttaaa tgaagaagat atattagcta tt 272

<210> 184
<211> 614
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 184
tcaagacacg ctttctagtg ttttatctct agaatatcct gaaaaagaaa ttatcattat 60
caatgatgga agttctgata atactgctga aatcatctat gaattcaaga aaaatcatga 120
ttttaaatgt gttgacctcg aagtcaatag aggtaaagct aatgcactca atgagggaat 180
caaacaagca tcttacgaat atgttatgtg cttagatgct gacactgtca ttgatgacga 240
tgcgcccttt tatatgattg aagactttta aaagaatcca aaattaggcg cagttacagg 300
taatccacgt attcgtaata aaagttctat cttaggaaaa atacagacca ttgaatatgc 360
aagtattatt ggttgatatca agcgaagtca atctctagca ggagcaatca atactatttc 420

agggtgttttc acactattta aaaaaagtgc actcaaagat gtaggttatt gggatactga 480
catgattact gaggatatcg ctgtttcatg gaaactccat ctttttgatt acgaaattaa 540
gtacgaacca cgcgcacttt gctggatggt ggtgcctgaa actatagggtg gtttatggaa 600
acaaagggtt cgat 614

<210> 185
<211> 329
<212> DNA
<213> Staphylococcus epidermidis

<400> 185
gttttcttat tacgaaccac attggttcta ccaattttca taatttaaatt ttactttcaa 60
aaaagcaatt agatgaaatg tatgaaacag gcttatggga ctttgaatct catactcatg 120
atttacacgc tcttaagaaa ggcaataaat cgaagttttt agattcgtct caatctgttg 180
ctagtaaaga tattaataaaa agcgaacact atttaataaa aaactaccca aaaaatgaac 240
gcgcacttgc ttaccatac ggattaatta atgacgacaa aataaaaagct atgaaaaaaa 300
atggaattca atatgggttt acacttcag 329

<210> 186
<211> 220
<212> DNA
<213> Staphylococcus epidermidis

<400> 186
ttattctgct atatgatatt cacgaatatt gttatcaata gattttaaat agaaaatgtc 60
acgatctgca tttgatTTTT caagttcatg attcaattct aattggtcaa agcgtttgaa 120
gaaatgttca tattcatcaa cagaaacctc tattctatta ttaataaaag atttgtggcg 180
ctcaacatct aattgctcct tgaatccatc tactaatggt 220

<210> 187
<211> 210
<212> DNA
<213> Staphylococcus epidermidis

<400> 187
acattaagtc agcatttggg aaaaacatga ataaatgtct aaaccatata gcaatggttt 60
gacgataatc aaattcaggt tgaatcgcat tggttacaag cgtagaataa caaccatta 120
ttaaaataat caacaaaacg atattcacia atatattctga aatgaactt aatcgtctaa 180

cgtttttgat ggatagtcgt cttaaagtta 210

<210> 188
<211> 200
<212> DNA
<213> Staphylococcus epidermidis

<400> 188
attagagcca aagtactctc caccgtaacc ttgacttcct tgcgctttat aagtatctaa 60
atatgtttct ttatgggaag aaggcacaac aaaacgatct tcatatttag caatacctag 120
taagcgatac atttcagtca tctgtctttc agtaagtcct aatcgttcta atttagaagt 180
atcgaaaggt tggtttgtaa 200

<210> 189
<211> 284
<212> DNA
<213> Staphylococcus epidermidis

<400> 189
tttgatacct gtaatttggt cttgccaaagc gggagtatat ttagaagatg cgtcatacata 60
agatgtagct tctagttcgt gttcaaaacg ttgaacacca tattgactcg tcattaaatc 120
ataaaccgta gcaattttta cttcttctcc gttagctaac tgaatagttc tcgttgcaat 180
aggtctctca aagataccat caccactgct atcaaaatat ggaaattgaa tcgtttcaac 240
atgatagtca ctttcaacca ttgataacat tggatcaatt ggtg 284

<210> 190
<211> 721
<212> DNA
<213> Staphylococcus epidermidis

<400> 190
agcttctcgc actacttgac taggatcatt agtgacctct attcctacca ttaaaccctac 60
accacgtact tcaattacat ttcttttatt tactaaactt tttcttaagt tttcaataag 120
aaattgcccc ttgattgaa catcattcag caaatcagca tcattaatga tagaaagcgt 180
ttggtttgca gcagccaatg ataatctatt tccaccgaat gttgtaccat gagaaccgta 240
gccaaatgca tgacctaaat tctttttgce taacattgct ccaataggaa ggccattacc 300
taatccttta gctaattgtga tgatatctgg agacaattga taatgttcat gagcatataa 360
cttaccggtt ctacctatgc ccgtttgaac ctcgtctaca attataagga tatctttttg 420
tttacaatac tcatttaatt gcttcataaa taaaggatca gcaggtagta ctctgattc 480

accttgaatt atttctataa ttacagcagc agtattatth gaagttaatg atttaaatga 540
 attaaaatca ttaaaaatag caaatttgaa tccaggaaca accggaccaa attgatctgt 600
 aattttcttc tgtcctgttg cagacattgc gccgtacgtt ctgccgtgaa aagacttttt 660
 aaaagcaata atttccgact taccagtagc ttacgtgcg agtttgatag ctgcctcatt 720
 c 721

<210> 191
 <211> 465
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 191
 aaagaaatta agtctctagc caaaatgtat cttggtggta gtactgaaat taaaacatca 60
 caacttaag gtaaggatga ctacttaaat gatataact attaccaccc aagcgtaaaa 120
 agtattatgg aatattcaaa tcttttacgt aatgatttag atttatctca aataacaaac 180
 aaaaacgatt tcttagatca aagagtcatt aaacgatatg gttcactcgt acccttaaca 240
 gaattagatg aagacttatt gcgtaagaac caaaaggaat cgactgatag tcagaaagag 300
 tctgattctt catcacaaaa taatgatgaa gaagatcaaa ctaacgaaca aacagaccaa 360
 aatagcttaa acggaaacga acagtaccca aatcaacaag acaacaatca aaccaatggg 420
 gaaaatggta tgataaataa tgacaattat ctttacgcac aataa 465

<210> 192
 <211> 362
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 192
 aaccaaacga tgctagatga ttgctttgaa ataagaaagt gtgttttctg cgaagaacaa 60
 ggcgtaccac tcgaaaatga atttgatcaa tatgaagatt actcattcca tatagtggga 120
 tatataaatg gtgttcctat ggcaactgct agaattagac ctttaaatac tcatatttgt 180
 aaaattgaac gtgtagcaat catcaagtgg tatcgtggtc ttgggtacgg taaaaattta 240
 atacatgcta ttgaaacaat tgcaaaaaaa caccaataca atgaactcac tatgaatgct 300
 caattacaag ctcgagactt ttacttaaaa ctaggttact caccttttgg taaagtattc 360
 tt 362

<210> 193
 <211> 320
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 193
 agttttataa tattcagtgc aaaattcaat tattgcgttt tgaagtggat aatagtattc 60
 gggttgtaaa gatagttcat tatataaata aaatttttct ctattagttt tacatttgat 120
 ttgttccttt ttccactggt cttgccattt agattcttct atatttaaaa tttctaaaaa 180
 tagattttct tttgttttaa agtgataata aagattccct ttactacttt ctgataattt 240
 aacaatttct ccagtagtag tggcattata tccatttttt ataaataatt cctttgcgac 300
 acctagtatt ttatctttca 320

<210> 194
 <211> 503
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 194
 tttagagaga cagctagata atttgaaaac atttggcgta gagaaaatat ttacagagaa 60
 acgatcgggg aaatcagtag aaaatagacc tgtatttcaa gaagcactta actttgtgag 120
 aatgggcgat agatttgtgg tagaatcgat tgatcgctta ggtcgtaatt atgatgaagt 180
 gattaacaca gttaattatt taaaagataa agagggtcaa ttgatgatta ctagcttacc 240
 tatgatgaat gaagtcattg gcaatccatt attagataaa tttatgaaag acctaatcat 300
 tcaaataatta gcaatggttt cagaacaaga acgaaatgaa agtaaacgta gacaagcaca 360
 aggtattaaa gttgcgaaag aaaatggtgt atataaagga cgccctctat tgtactcacc 420
 taatgctaaa gatcctcaaa aacgcattat ttatcataga gttgtagaaa tgtagaaga 480
 aggtcaagca attagtaaga ttg 503

<210> 195
 <211> 320
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 195
 tgaaagaagg gatagttttg cactttacac aacgtgaaca agacaaattg atgatagttg 60
 tagctgctga gggtgcacgt cgtagaaaag caagaggact taaacttaat catcctgaag 120
 cacttgcttt aatcagtgat gaattattag aaggcgcgcg tgatggtaaa acggtagctg 180

aactcatgag ctatggaaaa acaatttttaa acgaggaaga tgtcatggat ggcgtagcta 240
 acatgattac agaacttgaa attgaagcaa cttttccaga tggactaag ttaataacag 300
 tccatcaccc aatcgtttaa 320

<210> 196
 <211> 503
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 196
 atgcaaatta tggagatgaa gctactttcg gtggcgga aa atcaattcgt gatggtatgg 60
 ctcaaaatcc taatgtgaca agagatgata aaaatgtagc cgatttagtt ttaactaacg 120
 cattaattat tgattatgac aagattgtta aagcagatat cggaattaaa aatggttata 180
 tttttaagat cggtaaagct ggaaaccag atataatgga taacgttgac atcatcattg 240
 gtgcaacaac tgatattatt gctgctgaag gtaaaattgt tactgccggc ggtatcgata 300
 cacacgtgca cttcatcaat cctgaacaag ctgaagttgc acttgagagt ggtattacaa 360
 cgcataatcg tggaggaact ggtgcttctg aaggtgctaa agcgactact gtaacaccag 420
 gaccttgga tattcatcgc atgttagaag cagcagaaga gatgcctatt aatgtaggat 480
 ttactggtaa aggtcaagct gtc 503

<210> 197
 <211> 452
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 197
 tgattataga agaaattcaa ggaaatattg ctaatttatc tcaagatgaa aagcaaaaac 60
 atgtcgaaaa agtttatctt gaaaactcag atttggttaa acgtatacaa cgtgttaaaa 120
 cagatcacgg taatgaaata gggatacgtc ttaaacaacc tattgaccta caatatggtg 180
 atattttata tcaagacgat acaaacatga ttattgtcga tggttaatagc gaagacttat 240
 tagttattaa acctagaaat ttaaaggaaa tgggagacat tgctcatcaa ctaggtaatc 300
 gccatctgcc tgcccaattt acagaaactg aaatgcttat tcaatatgac tatcttgttg 360
 aagatttatt aaaagagttg ggtatcccct actcacatga agacagaaag gtcaatcaag 420
 catttcgaca tataggacat tcacatgatt ga 452

<210> 198

<211> 524
<212> DNA
<213> Staphylococcus epidermidis

<400> 198
ttaacttatt cagatgggat agctatgaga attgtctacc acgcattaat taacaatgac 60
aaagataaaa ttttagatat taaccaaaaa ctcttcgtac aaaatctacc taaagaaacg 120
cgtattggcg ctaagcaaat gggtagacgc atggtaaaat tagctttaga tctttatgat 180
agtgaatgga ttcaatggta ttataatcaa atgaaaaaca ataaaattaa gcttcacact 240
gctgtgtgct ttactatgct aggacatddd ttaggtgtag atgtggaatc catcattgat 300
tattatddd atcaaaatat ctctagcctt acccaaaatg cagtaagagc gattccttta 360
ggacaaacag ctggacagca agtcgtaact gaaatgatag cccatattga gaagacacga 420
aatcacatac tagaattgga cgaaatcgat tttggtatga ctgctccggg cttggaactt 480
aatcaaatgg aacatgaaaa tgttcatggt cgaatcttta tttc 524

<210> 199
<211> 500
<212> DNA
<213> Staphylococcus epidermidis

<400> 199
tcgtatatgg aatttgtagc agatcctatt attgcctatg aaaacgctaa atttttccaa 60
cataatacgt ttaatcttaa agaagatagt gctatgtttt aactgatat attgactcca 120
ggctattcat ctaatggcca agatttcacg tataattata tgcactttat taatgaaatt 180
tacattgaca atcaattagt tgttttcgat aacatgatgt taagtcctga taaaagcaga 240
cttgacggca ttgggtatat ggaaaattat acacacttag gatcagctta ttttattcat 300
ccagatgtaa accaaagttt catagacgat atttacggcg cggttgctga ttttcaaaaa 360
caatacgact gtagaatagg tatctcacia ttacctactc atggattggc cgttcgtatt 420
ttgactaaaa gaactcaa atagaagaa attttgactc gtgttcaatc atatatcaat 480
caaacgattt atcatcgaca 500

<210> 200
<211> 363
<212> DNA
<213> Staphylococcus epidermidis

<400> 200
gcttaacaac gtaaaacaag ctggcggtga tcaaattgta actattattg gtcattggcg 60

tgagagtgtg aaagatacat tgggtaatca atcattatat agttttcagg ataaacaact 120
 tggaacagct catgctgtga aaatggcaca tgaacattta gcagataaag aaggaactac 180
 tctagtagta tgtggagata caccacttat tacataccaa actttacaat cacttattga 240
 acatcatgaa agtacacaat cacatgttac tgtattatct gcttctacta tcaatcctta 300
 tggttatgga cgaattatta gaaatcataa tggaatatta gagcgtattg ttgaagagaa 360
 aga 363

<210> 201
 <211> 780
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 201
 agctcacggc tttaactatg ctatttataa agatgtgggt ttagatttct gaaaactgga 60
 atatattctc tttgttgatc tactaagtct acatcgatat gtgttgtagg tactccttct 120
 ttatcatcta aatgggtctaa aatttcacca ttaggattaa tgacaattga atttccagca 180
 taattggtgt gaccatcatc accacaacta ttacaagcta caataaaaat atcattttcg 240
 attgctctcg ctttttagtaa tgataaccaa tgatctagtc ttgagctagg cactgcgct 300
 acataaaaag caatttttagc accttttcta gctggatagc gcaatatctc tggaaatcgc 360
 aagtcataac aaatgatttg cgtcacaaagt gtttgatcag ataaataaaa aggttcaggg 420
 actacatttc caccacataa aaagtctggc tcacgtaaca ttggcacgag atgtactttg 480
 tcatattcat taatcaattc tttgttttta ttaattgcaa aagcagtatt atatatatgg 540
 ttttctctta tatttgacac tgaacctgca atgatatcta cattaaatgt atgtgctaag 600
 tcttttataa agagagagct gtctttaaga tttttatcag ctttttggtc taattcttct 660
 aatgcataac cgttattcca catttctgga agcacgacga cactggtatc tttatctaag 720
 tattgattaa acttagtttt gatattttgc atatttttat caacatttcc acgttctaca 780

<210> 202
 <211> 501
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 202
 gtatttacgt gcgtttatct gtgtcataat catcgtgaca cacttactaa cgcaaatcac 60
 tttagaaaat gaacagatgt ctgatagttc actcatattg caatattata tacgcaatat 120

ttttattttc ggcaccccta gttttataat attgtctcaa ttattaacaa cattaaatta 180
cgaatcagta actataaatt atcttttttc aagatttaag tatattttta ttccatatct 240
tttaatcggc ttgttctata gttatagtga atcacttata accgcttctt cttttaaaaa 300
gcagtttata gaaaatgttg ttttaggaca atgggatggc tatttcatta tcataattat 360
gcagttcttt gttctatctt atatcattta caaaattaat tttagattgt tcaatagtaa 420
aattttgctg ctttttagcat ttatagtcca acaatcttat ctacattatt ttttgaataa 480
tgacactttt catcaattca t 501

<210> 203
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 203
ggtcaagccc agacagaggc aatatccaac ggtaacctct tatttaaata tagttaggga 60
gagcttattt attactatat ccggagtatt ttggatgtat tgtatcgttg tgatgattgt 120
ttatatagga actcttatca atttctcaat ggaaagtgtt ataacaatac gtattgcatt 180
aaatgttgaa aacacggaaa ttacaaatt attcggatgg atgagtttgt ttgtacttat 240
tatattttatc ttttttacat ttagtctcgc gtttcaaaaa tataagaaag gtcgtgacat 300

<210> 204
<211> 406
<212> DNA
<213> Staphylococcus epidermidis

<400> 204
catttaacag tgaatatact tggcttttaa aacggttttt actgtcctca ataacccga 60
atttttgtga aaaggaggct ctaaaatacc aagtctcaag aaaaagaaga attaatgtta 120
taaagtcttc tttattcaaa gcgatgtgcg taggatcata atactttatc aattcatcat 180
gtaaggtagt attaatctct tgaagatggg gtttgatttc tgaattcagt gcttctggag 240
cactagataa ttgaacatat aatttaatat atctctcatc aacgtcgaat ataaatttga 300
ataaaaaactg gtaaagtccg tcaatggaat aattatcgtc atggttccta agcaaaaaat 360
ctataaagta attgaaacaa ttctcaacac tttttcgata tatttc 406

<210> 205
<211> 325

<212> DNA
<213> Staphylococcus epidermidis

<400> 205
atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga tcaagattgg 60
actaaattag gaactagtat cgttgacatc gtagaaagtgc gcgttagcgt attaggtaaa 120
atcttcggat tttaattaat cttagttttt taaaatataa atttaaataa ttaattaggg 180
agagataaac atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga 240
ccaagattgg actaaattag gaactagtat cgttgatatac gtagaaagtgc gcgttagcgt 300
attaggtaaa atcttcgggt tctaa 325

<210> 206
<211> 451
<212> DNA
<213> Staphylococcus epidermidis

<400> 206
tgacacaata cctcatgaac caccacaata agttgatacc cctcacttat tttgtaaaga 60
aatttaaaca agcaaaatcg tcaattagtg aagacgttca aatcattaaa aatacgtttc 120
aaaatgaaaa attaggaact attattacta cagcaggtgc tagcgttgga gtaacctata 180
agcctatgat gagtaaatca gaggccacag aggttggtga tgaggtgata gagcaattac 240
aagagaaaaga ccgtttgcta cctggaggat atttatTTTT atccgattta gttggtaatc 300
cttctctatt aaataaagta ggtaagttaa ttgctagtat atatatgaac gaagaacttg 360
atgctgttgt taccatagcg actaaaggga tatcacttgc gaatgcagtc gcaaacgtat 420
taaatttacc ttagtggtt ataagaaagg a 451

<210> 207
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 207
gtgacagatg taagacttag aaaaatacaa acagacggca gaatgaaagc actcgtttcc 60
attacgctag atgaagcttt tgtaattcat gatttacgtg taattgaagg aaactcaggt 120
cttttcgctg caatgccaag taaacgtaca ccagatgggtg aattccgtga catcgcgcat 180
cctatcaatt ctgatatgag acaagaaatc caagatgcag tgatgaaagt atatgatgaa 240
actgatgaag ttattccaga caaaaatgct acttcagata acgaagaatc agacgaagct 300

<210> 208
<211> 380
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 208
atgaaaataa tcaactcaga taaggtaccc gaagcactag gcccatattc gcatgcaact 60
gttataaacg gttttgtctt tacatcaggt caaattccac tcacacttga tggaacaatt 120
gttagcgatg atgttcaaga acaactaag caagtttttag aaaatttaac tgtggtatta 180
aaagaagcag attctgattt gaattctggt gttaaagcga caatctatat ttctgatatg 240
aatgattttc aacaaattaa tcaaatctat ggaaactatt tcgtcgaaca ccaaccagct 300
cgtagttgtg ttgaagtgtc acggttgcc aaagacgtaa aggtagaaat tgaattgata 360
ggtaaagtga aggaattata 380

<210> 209
<211> 245
<212> DNA
<213> *Staphylococcus haemolyticus*

<400> 209
atgaacatga gcgacatcat ctttcttaat ggcatgcgtt tttatggcta tcatggagcg 60
cttcatgcag aaaatgaact tggccaaatt tttatagtag atgtaacact taaagttgat 120
ttgactgaag cagggaaaac ggataatgtc aaagacactg tgcattatgg tgaggtcttt 180
gaagatgtta aaaacattgt tgaagggcc a tcttgtcaat tgatagaaca tcttgcagaa 240
cgtat 245

<210> 210
<211> 563
<212> DNA
<213> *Staphylococcus haemolyticus*

<400> 210
ttgaattggg aacgacagct ttgaaagtg caatcgattc agcaaattatt gatcctaata 60
taatacaaca agttattttc ggtaattgtc tacaaaagggtg ttagaggaca aaccagcac 120
gtcaaattgc gattaaagcg ggtgtacctg atacaacacc agctatgaca attaatgagg 180
tatgtggatc aggtcttaaa gcaattatat tagggaaaca gtttaattcaa ttaggtgaag 240
cggatgtagt agcagtgggt ggagttgaaa gtatgacaaa tgccccaca ttaatcttaa 300
aagaaggtca agaaccagtg gaaagcttta tgcattgatg tttaacagat gcctttcatt 360

atgtaccaat ggggtgtaaca gctgagaaca tagctgaaaa atatgacatc acgctgtaaa 420
tgcaagatga gttcgcaaat cattcacaag ctaaagcagc taaagcgacg caagatggta 480
aatttaataa tgaaatcatc ggtatgactg acgcagaagg ggaacaaatg acttctgatg 540
aaggtgttcg cccaaatagt agt 563

<210> 211
<211> 231
<212> DNA
<213> Staphylococcus haemolyticus

<400> 211
aatgacgatg aaacttcctt tgcacaccgt gttgaagcgg atggctggga aaatgaattg 60
gctatggttt ttgttggtat taataacaaa tctaaaaagg tatccagtcg ttcaggcatg 120
tcacttacac gtgatacatc acgtttttat caatattggt tagataacgt tgaaccagat 180
ttgaaagaga ctaaagaagc cattgctcaa aaagatttca agcgtatggg t 231

<210> 212
<211> 278
<212> DNA
<213> Staphylococcus haemolyticus

<400> 212
catcaattgt gtgataatga taagaattat atgcaagttg ttaaacadat tggttcttta 60
gtgtattcag ctagtgaagc gattgagcat catagttttg atcaattagc tacaatcttt 120
aatcaatgtc aagatgactt aagaacattg acggtgagtc acgacaaaat agaaatgttt 180
cttcgcttag gagaagagaa tggttcagtc gctggcaa ataacaggtg cggccgtggt 240
ggtagtatgc ttatcttagc taaagaattg caaacagc 278

<210> 213
<211> 200
<212> DNA
<213> Staphylococcus haemolyticus

<400> 213
acgtatatcg tcctgaatat tttctaagta gtaaatagac ttatcgcat cagtttggtc 60
agtagcgtga tcgaattcta aatcatcgaa tcgcttgaag aaactttcat agtcttcaac 120
tgaaacttct tgacgttcat tcaataaggc tttatgtcct tcaatatcta attgtttttc 180
atagccttcg actagcgtag 200

<210> 214
 <211> 565
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 214
 aatcggtccac ttgtcttttg aaaatgactt catataaaact ttgcctaact taatttgaaa 60
 ggtaagggttt atggcgcatc aatttatata actagagaag acctttaag cattccaaaa 120
 tagtcgtagt agtcacgaac aagatagatt atttatagat atagtaaacc acatacaacc 180
 taaacttttt ataaaattta aaagttatgg aatacaaaat gaagatattg aagatttagt 240
 acaagaaaact ttaatcagga tttatttagc acttcataca tttgatttta gtacagacgt 300
 tccttttgaa cactatttga attgtatcgt acgatcgatg cgaaatgatt tttggagaag 360
 aaaatatatt gagactgata agtacgatag catcattaat gactatgtta ttgactacaa 420
 attgaatcaa tcaagtaa atattgaaga tttttgtatg ataaaagaga aacgagaatt 480
 gctagcgagt agtttaacag tattaagtcg attcgagcga aacgtagctg aattactaat 540
 gtctgattat acgcctagtg aaatt 565

<210> 215
 <211> 635
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 215
 ccaagatgct aatgtgtctt caaaagaatc ggaaatcgac aaaaatatta ataaagtaga 60
 cgacgcgcag tcttattctc aacaaaatga gcaacaatcc tcaaaagccg aaaataagga 120
 aatacagaat tcaacacaag cagaacaagt tgaaaaacag gaacaacctg cttctaataca 180
 gacggcta at cactcttcaa aagagtcctc cattaataat caggaaagtc ataacaaca 240
 gcaacctagt gatgacaaaa cacctaatat caaaccagaa aaaattgaaa aagtagataa 300
 tcataagcgt attcaagatc agtatcaaga taaaaacaag caggttgata ataataatc 360
 taacaattcg caattaaacc aaaaagaaca tcccaattca tcaaataata aacaacaaaa 420
 gcaacgtcta gatgttaa ac caaaaacga taaccaacaa ttacaatctc gaaatgatgt 480
 aaaagaaaaa ttagataacc agccaattga gcaaaaagat accaagctgc aaagtaacaa 540
 taaaagcaaa gacaacacaa cttctgtaaa gtcacacagc caacaacata aaccgcatc 600
 attaaagacc caatcccatt taactccagg tcaaa 635

<210> 216
 <211> 468
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 216
 tgcgaattaa acagttaggc attaatgac aaatgaattg cgtaaaattg tataatgata 60
 ccaaggagcg tgacgctaatt ttgaaggcga tagacaaaaa aattgaaaga tttgctagat 120
 acttgacgcg tcaaaaacaat ctagaccata ttcaattttt gaagatacgc ctaggcttac 180
 aagtcgcatt aggtaatttt ttcaaaacta ttgttactta tgggtgttgc cttttattcc 240
 atacctttct ttacacatta attacacact taacgtattt ttctgttaga cgttttgcgc 300
 atggtgcaca cgcaaggcca tcattgttgt gccacattca aaatttagtt ttatttgttg 360
 cattaccttg gtcaattgtg cattttcaag tgtcttgac attcatgatt tttgtagcat 420
 ttatcgcat cataattatt atatgttacg caccatcggc aactaaaa 468

<210> 217
 <211> 450
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 217
 tttaattgtg ttatttgttg ctaaaatagt agccgatatt aaatttcaa tgagggatta 60
 ttttgccatt tttggtatca taatcccttc aactatactg tttggcgtga taggtagaca 120
 gtctttaata tttttgataa ttggatgttt aatattcttt tatttgaaaa taggcttata 180
 ttccgtttta gcaatctttg gttctgcgct tattatgtat gttagtaatt atatttctgt 240
 catccttagt gtaattgctg attatttttc tttaagttat atagttcaa taataataat 300
 attagtttgc tttactctaa tatcaataat ttgtgcttat ttcattaggt ttctattaat 360
 aagctcaaaa aaaacctatc tgtatttcaa caaaatatac atatcagtaa tatctatttt 420
 ccttatttta tctttgatca tgctctattt 450

<210> 218
 <211> 466
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 218
 tatcaatctt tcaagcagtt atgttaataa ttgtagctaa aattattgca aacgttaagt 60
 tttacttaag ggattattta gccgttgccg gcataatagt cccttctgcc gtattatttg 120

ttgttttttg cagacaatca attatctttt tacttattat ttgtttaata tactttttatg 180
 taaaaatagg gttttattct ataatcgcta tattaggctc tgccttaata atgtacataa 240
 gtaacttttt ctcagtttca ctcataatat taataggtaa ttttatcaaa tttaggataa 300
 tatacgtaat aatttcttta tcatcataca tactgatagg tgttttatgt gcatttatga 360
 caaaatactt aattaataaa ctcaaaaaaa catacttatt ttttaataaa gtatacataa 420
 tcgtcatatc tactttttta acatttacca tcgctatatt ttattt 466

<210> 219
 <211> 512
 <212> DNA
 <213> Staphylococcus lugdunensis

<400> 219
 caaaggagtg tgattttatg tcaaaaatgt tagttctttt ttctacatgt attcttttaa 60
 tgtcgatgtc gttaattttt atgcctgtta gtcatgcgca aggtttatcc tctaagcaag 120
 caacgttgta tcagcagaat ccaaaagata ctaatactca agtttcagga aaactgaata 180
 attcgaaaga aacaaaagca aatgatacag caaccttatt tgcaaaactct aaagtcaatc 240
 aatatattat cgacaatcat cttcagcatt cgccagtagt aaaagatcca cgtatggata 300
 cacttcctaa attagaatat aaaaacggca cttacatggg tgttgttatt cacgaagtgg 360
 gcgaagacaa tcgtccttta caagtatggg tagatcgcat gtatgaaact tatactagag 420
 catttgta caacattcgtt gataataacg aaatacatct tactgcacct gcagaatatt 480
 atgtgtgggg agctggtcct aaagctaata ca 512

<210> 220
 <211> 646
 <212> DNA
 <213> Staphylococcus lugdunensis

<400> 220
 gaagtggagc gtaatttgtc aaaacaacaa atacagcata ataatgatgc tactggtgac 60
 actcaagatg ataataatta taataatgaa atatcaaatc aggaagcaac aacgcagaac 120
 aaacaaataa ctcagtctga caatgtaaat agcgaggcac aagcaataaa tgaaataagc 180
 gacagccatc gtacagtaaa taaagccact gaagcactag acaataactc tactttaaat 240
 acatccaccg atgtatcacc tgcaacgaaa caagatacaa ctactagcaa tcaaacaact 300
 caggaaaaca atgatgcaac aacacaaacc aaaacaaatt ataagcaaga tggtataaac 360

aacgtattat cccaagtagc aaccaatgac aatcagtcctt caaatcaacc acgtaacagt 420
 cacctaaata catccacagt aacatacaac aataatcatc aagtaagaag attagcaaaa 480
 gttgaagcaa caaatacaga taataacggt actcagactt cagacatatc gaataaactc 540
 tcaaattgaa cagcgacaat tgaagcggca gatacgattt acccacataa agcagaatat 600
 gtaaatttaa attatcgttt ccaagcccca gatgatgttc aagcag 646

<210> 221
 <211> 500
 <212> DNA
 <213> Staphylococcus lugdunensis

<400> 221
 tgtcaggtat cgtagatgca attactaaaag cagtacaagc aggttttagat aaagattggg 60
 ctacaatggc tacaagcatt gctgatgcaa tcgctaaagg tgtagacttt atcgctggtt 120
 tctttaacta aaatataaat tgagacttta acaataatcg taaaaaggag cgttttacaat 180
 atgtcaggta tcattgaagc aattactaaa gcagtacaag caggtttaga taaagattgg 240
 gctacaatgg gcaactagcat tgcagaagca cttgctaaag gcattgacgc aatttcaggc 300
 ttatttggtt aatctcaaat ataataaata atactattta aaataaaaaat attttttaaag 360
 gagcgaacat atcatggacg gaatttttga agcaatttct aaagcagtac aagcaggttt 420
 agacaaagac tgggctacaa tgggtactag cattgcagaa gcacttgcta aaggtgtaga 480
 ctttattatt ggattattcc 500

<210> 222
 <211> 500
 <212> DNA
 <213> Staphylococcus saprophyticus

<400> 222
 gaaataaaccg cattccaact aacactttaa ttaatggaga aaagagaacc aaaccaatcg 60
 atgtgcctga aattttttaa gtcttaagct caatgattcg tagacgttta tatcattttg 120
 ctatacatcc aaatgaccaa gaagatttgt gtcaagatgt gctcgttaaga ttatactgtg 180
 catttaaaaa atttgatttc actgatgaca cacctattga gcattatgta aatcgtgtga 240
 ttaaaaaatgt aaaaaatgat tatatccgta aaaaatgcta tggcaacca cgacaagaaa 300
 tgctgggtcaa tgaatttata gtcaatgatc aaaatagtaa aacagaacac ccacttgata 360
 aacatatatt agcttttagag ataggaagtc aattacaaca gggattaatg aaactgacgg 420

tcttagaaaa aagtatcgta atctattttac taaatgactt taagccgaaa gaaattgctg 480
 aaacactaaa tatacaaatac 500

<210> 223
 <211> 432
 <212> DNA
 <213> Staphylococcus saprophyticus

<400> 223
 aagagaacca aaccaatcga tgtgcctgaa atttttaaag tcttaagctc aatgattcgt 60
 agacgtttat atcatttttg c tatacatcca aatgaccaag aagattttgtg tcaagatgtg 120
 ctctgaagat tatactgtgc atttaaaaaa tttgatttca ctgatgacac acctattgag 180
 cattatgtaa atcgtgtgat taaaaatgta aaaaatgatt atatccgtaa aaaatgctat 240
 ggcaaccaac gacaagaaat gctggtcaat gaattttatag tcaatgatca aaatagtaaa 300
 acagaacacc cacttgataa acatatatta gcttttagaga taggaagtca attacaacag 360
 ggattaatga aactgacggt cttagaaaaa agtatcgtaa tctattttact aaatgacttt 420
 aagccgaaag aa 432

<210> 224
 <211> 200
 <212> DNA
 <213> Staphylococcus warneri

<400> 224
 aaaagatatg acataatggt acgaatagtt aaactatccg gatcaaatgt taactttaca 60
 cattcagcat aaccatcgta ttcaccattc aaattcgatg ttattccatt agcccttcca 120
 gcttcagttg atacgatacc tggatatagtt ttaaaaaaag cttgaacgcc ccacaaacaa 180
 ccgccagcta catatactat 200

<210> 225
 <211> 515
 <212> DNA
 <213> Staphylococcus warneri

<400> 225
 catccaattt acagaaccat ctttttcatc tatgactgca ttattaatta taatgcttac 60
 taaattgtcg attgcatcgt caatattgtc tgaattttact atttcatatc cataatttat 120
 aaatccatta ccatcaataa ataattttatt ttgactttct aatgaaaatt ttattagttt 180

acattgaaac aacaaatctt tcaaagaata tctttgcgtt ttttctaaaa atacattgag 240
 tgggtttttc aataagtgat gtaccgtatt atttttaata tcttttaccg aaacactttg 300
 gaccttagta taaaaatagg gtactgaaag agtttctatt tgttttattt ctgaatttat 360
 taacttatca cttaataaat ttccaccgta ctcttctagt ttgttaaaca agctctttcg 420
 cttatttgca taaagagggtg atttagcagc ttgtattaat actgagtact caattgtact 480
 tcttggtaaa attctcactt ctacttctga tgacg 515

<210> 226
 <211> 320
 <212> DNA
 <213> Staphylococcus warneri

<400> 226
 tgtatcaact ccacttttatt catattaatg acgacgcact tacactcaca aagtcaaagc 60
 aagacaccat tcacttattt ataggcaatt ggattaaccc atcagcccaa aaatctatta 120
 gcattcgaac tggcggtgat acgaatcaca atcaatatca aattcttcaa attgataccg 180
 aacatcaacg tattaactg acttctgaag aagatcctca actcatgtat attttagact 240
 acgaagatac aaaccatata ttcatacaaa catcagttaa gaattcgtat ggcacgtcaa 300
 gacccataag atacgaaaaa 320

<210> 227
 <211> 271
 <212> DNA
 <213> Staphylococcus warneri

<400> 227
 agcaagttct ttgttaattg caactttgac atcagcgaca ttaattaato cggcacatgc 60
 agaaacgaca tcatcaaccg ataatcacca acaaaccaca caatctcaac aacaaaagac 120
 accgaagatt gataaaggta ataacgtcaa acctgttgaa aagaaagaac gcgcaaattgt 180
 catactacct aacaatgatc gacatcaaat taatgatata acgttaggtc actatgctcc 240
 tgttactttc gttcaagttc aatcaaacga a 271

<210> 228
 <211> 500
 <212> DNA
 <213> Staphylococcus warneri

<400> 228
 tattgtcaaa gtcacaacaa ttagatatag aattaaagc gatacttcaa caattcaatt 60

cttttattat gagaagaatt aattatatatt ctcaaaatga ttttgaaaaa gacgaccttt 120
 atcaagaagt gctcatcaaa atatatctag cgcttgagcg ccatcatttt caatatgatg 180
 attcgtttat aaaatatata tcgcggtca tcaaatcagt taaatgtgat tactatcgac 240
 ggcattacac tcaacagaag cgatatatga atgtagttaa tgatgctgtg gttgaatatc 300
 aaacgaacct gcttaataga gatcgagttg aaagagaaat attaacatgt gaagcaatca 360
 aactattgaa cgcggtgtgt gagaaattaa ctaaacaaga acgagaagta tttgaatttt 420
 atagtaaagg ttataaacca aaagaaatcg cacatttact aggtataaaa gacaaagtag 480
 ttacaatgc gatacaacgt 500

<210> 229
 <211> 400
 <212> DNA
 <213> Staphylococcus warneri

<400> 229
 tcagatataa acaatttaac aaggatgtta tcaactgtagc ggttggttac tatctaagat 60
 atgcattgag ttatctgat atatctgaaa tattaaggga acgtggtgta aacgttcac 120
 attcaacggt ctaccgttgg gttcaagaat atgctcccg tttgtatcaa atttggaaga 180
 aaaaacataa aaaagcgtat tataagtggc gtgttgatga gacatatatc aaaattaaag 240
 gacagtgggt ttatctgtat cgcgcgattg atgcagatgg acatacatga gatatttggt 300
 tgcgtaagca acgagataat cattcagcat atgcgtttat caaacgtctc attaaacaat 360
 ttggtaaacc tcaaaaggta attacagatc aggcaccttc 400

<210> 230
 <211> 758
 <212> DNA
 <213> Staphylococcus warneri

<400> 230
 taatcaaacg caacaacaac cttcagaacc acaaaaagcg aaagattctg atacaaataa 60
 tacgaatgtt gaacgtcctg aatcgaattc gacacaaaca tcaaatcaag aactgacaa 120
 aatgcaggat acatcaacta atcaaacaaa cgaaaattct aaacatatta ttgataaaac 180
 taatgacgtt tcacatgaaa ctacaaagac aaatgatata gatcaaacgt catctcaaga 240
 caattcagaa caatctcttg aagtcgactc aaatgaggca ccagcttcaa atgacaaatc 300
 aactccaacc aaacaagaac ctactaattc aaagcaagat attgatgaaa catctaaacc 360

taatgaagat tcaaaacttg taccatcaaa gtcaaataa acatctaaag cagataaaca 420
 agaacagtct tctaaagaac ctgttgagga taatgctcaa aaagataaac atgtatcaca 480
 agaagattca tctttagaaa agcaaggtac acaagaggtc ccgcagactg acacacataa 540
 agatgtcaat gtaacacctt caaagtcac atcagaacaa caactatcta caacacaaca 600
 cattacagct aaagattcta gtgcttcaca agagggtgcc gttcattcac tagattcatc 660
 taaacaagat cacacaacat cgactgagag ccatatcaat ttagataacc tagataaaca 720
 agcgactaaa gatcgtacac ctacagataa tggcgatg 758

<210> 231
 <211> 562
 <212> DNA
 <213> Candida albicans

<400> 231
 aaacgcattg ttaagagacc cagaaatcaa aactggtaaa gtgtctgttg cttcatactt 60
 gaagtttttg gattctgttc aattcaagag ttatggagac gaacctttgg aagtattggc 120
 tattgtggtta gaacaaaatg acaaaattcc taaattagac gagtttttgt catccaagac 180
 aggttggtta aacaatgtta ccgataatat tttcaatgct atcaagaaag attacagtca 240
 attatgttgg gttgttaatg aaaacgatgc caacttacct tggatattct ccaaatcaga 300
 tggttcatth gccaaagaatg gccaaatctt gttttgttac ggtttaaaca ttgacgaagc 360
 tagtaaatg attaaagaat ttgattcttc atctattgga tcatcgttgt catcttctaa 420
 agaatctggc gtattcacat ctgtcaaca aaagcgtggg ttccaccact ctacagtcgg 480
 tagaaacacc aatcctaate ctccattate tgaaggttaag caaaccgaga gaaaaaaagt 540
 tgctttgatt ggtgctagag gt 562

<210> 232
 <211> 524
 <212> DNA
 <213> Candida albicans

<400> 232
 caggtaagtc aaagtctggg gagttatctt ctactgggtc tgtgacaact aatacagcaa 60
 caccagatgt tccatcaact aaagtacctt cgaatccagg ggcaccaggg actggtgttc 120
 caccaccttt agcaccatcg acagaaacac aaactaccaa taatgtacca ggctcaccaa 180
 atatccctgc cactggaaca actgatatta ttagagaatc aactactggt tcacacacag 240

| | |
|---|-----|
| tgaccgggaa tggaaatact ggcgttccaa tgaatccaaa ccctgcgttg acaacaggca | 300 |
| cttcactgac tggcgcaacg aattctgcaa ctaacccttc tcatgaaaca ggtgttaata | 360 |
| caggatcagg aggtcgaact aatattgtca ctccaccttc ttctgcaact gcgacagtgg | 420 |
| ttattccagg aactgataat ggtgctacta ccaagggtea agatacagct ggtggcggca | 480 |
| actctaattg atctactgct accaccaata tacaagggtg caat | 524 |

<210> 233
 <211> 230
 <212> DNA
 <213> Candida albicans

| | |
|---|-----|
| <400> 233 | |
| gattaatgac atcaagggtt tagttaaagg cattaaaggc aaaaacggga aatcctactc | 60 |
| aagtgtccca gttgggactg ttgattcttg ggatgtctta gttgatggtg ccagtaaacc | 120 |
| agccatcgat gctgcagatg ttgtctactc caactccttc tcatactggc aaaaaaacag | 180 |
| tcaagctaata gcttcatact ctcttttcga tgatgttatg caagctttgc | 230 |

<210> 234
 <211> 632
 <212> DNA
 <213> Candida albicans

| | |
|---|-----|
| <400> 234 | |
| tctggtgaag gtttaggaag aaagaaatca ttaattagac cagaaagatc aagaatggat | 60 |
| gaaagccatc cacgattcca ttatactcaa gttgcaaata aagaatctaa tcatattaaa | 120 |
| gtacagccat cttcaactgg tgttgatcct cgtaaatcaa atgaattatc aacatcaaga | 180 |
| tcacatttga gtaattacgc tactccacca catcaagagg aagaagaaga cgaagggatc | 240 |
| cctttaatgg atatacacia tgcttcaccc aatggttagca gtgacaaaaa taatgatcta | 300 |
| aaaggtggac gtgaagttta tggattaaat gatgaaatca acgattatgg tagttcaccc | 360 |
| aagaaaaacc aagtcatttc atcttcaaga ccaatgaaca acgaaaaacc agctaaacct | 420 |
| aaacatgata tatattttctg gaaagtttat tggttatgcta ttacattttg ggcaccagct | 480 |
| ccattattga aattattttg attaccaaca aaagatcgtc aattcgcttg gagagaaaaa | 540 |
| atagggttga tttcttgtat tctttacgtt ggggcatttg ttgcttattt gacttttggt | 600 |
| ttcactaaaa ctgtttgttc gagtcaagtg gt | 632 |

<210> 235
 <211> 633
 <212> DNA
 <213> *Candida albicans*

<400> 235
 caccaaactc aggccttattc aaacaaggat actcctcctt ctccaatgcc gacggagcca 60
 ttatcagaaa tgttgaagca gttcgtgaaa tcgcctctat cttactcacc tccatgggtc 120
 caagtgaag aaacaagatc atcgtcaaca agttgggcaa aaaattcatc accaacgatg 180
 ccgccaccat gcttaacgaa ttggaaattg tccaccccg agtgaaaatc ttgatccagg 240
 catcaaagca gcaggaattc gaaatgggag acaacactaa cctagtaatc atccttgctg 300
 gcgagttcct caacgttgct gaaaaattgt taacattggg cttgaatgtc agtgaaatca 360
 tccaggggtt caacttgga aacaagtttg tgatgaaaac attggacgag ttggtcgttg 420
 aaaaagtcga gtcgttcgaa actgacctat taaaagcagt gaagccagtg atcgccgcta 480
 aacagtacgg cgtagaagat accatcgcca aactcgtcgt tgatgccgtt gccctagtta 540
 tgaagaacgg gtctttcaat gtcgacaaca taagagtggg caaggtcatg ggtgcatcgc 600
 tctcccaatc gcaagtggc aagggtatgg tct 633

<210> 236
 <211> 465
 <212> DNA
 <213> *Candida albicans*

<400> 236
 gaatgcaaag aaacattgaa atcaagagta ttttgatcca attgaccatg tatgctaagc 60
 ttaacgaaag ggtcgactat ttgttgaaa agttaacatc cactgaatta ttggatagtg 120
 aaaaagtcac gtcaaagttg aattcagaat ttgatcctca agaaaaattc gattatgata 180
 aattgattaa agacaagggt ctgaccttga gaaaaggatt gaaagatttg aaattcgata 240
 gagaagagat tgaaaatact ccttgctata atgaaatgat tgaagatttg tttgttcaaa 300
 tcaaggatga tcatccagag acaaaaaccg atggcgacaa attgattgaa tacttaaaag 360
 aacatagaaa caggatcgac gatgttttgt ctaaacagac tataaaattg gatgatttat 420
 tgtaccagaa agctcaattg atagtaagtg atgatttgca tacgg 465

<210> 237
 <211> 504
 <212> DNA
 <213> *Candida albicans*

<400> 237
 tgtctgctgc tagtgaatcc aaatattcta ctgaagtgc ttccgaatta ttgagcaaat 60
 tacaagttgc tgataataag gatgaagctg cttccaacat ttccactttt ttaaactcat 120
 ctattgttga acacgatgtt ccagttgaat ttttcgaaga ttgaaaaaa caaattcaat 180
 ctaaagatgc taaagtttct cttgctgctt tggatgctta caaacacatt gcttcaacca 240
 acggtttatc cccatccgtt gaaccatatg ttgttgactt ggtagtgaa gttgccgtta 300
 aagctggtga caaaaacaag gatgttcaaa ctgctgcttc tgatgcttta ttggccattg 360
 cttctgccat caccccaact gctgtcaaag ccatcttacc aaaattgatt gacaacttga 420
 ccaacaccaa caaatggact gaaaaagttg ccatcttgag agctgtttct caattgggtg 480
 aactgctaa agtcaaatt gctt 504

<210> 238
 <211> 526
 <212> DNA
 <213> *Candida albicans*

<400> 238
 tgacaggttc attggtgtct taaaaagtc ttggtaaaaa aggtggattt tggattttca 60
 cattattcaa ttatctctgt atcgggtgtt tgacatcttt gttcattgtc tccattggta 120
 atagaccaca tgcacaaag aatattttca aaacattaat catattgtta accatatgtg 180
 cattatacgc attggtgggt ggatttgtgt ttgttatcaa tactattgct acttttggaa 240
 ccggtggaac atctacctat gtgctcgta gtattgtggt ttcatgttg tccacctatg 300
 gtctttatac gttaatgtcc atttgtact tggacctatg gcacatgttg acttgtctg 360
 tacaatactt ttgatgatt ccatcgtaca cttgtacatt acaaataatt gcattttgta 420
 atactcacga tgtctcgtgg ggtacaaaag gtgacaacaa tccaaaagaa gatttgagta 480
 atcagtacat tattgagaaa aatgccagtg gagaatttga ggctgt 526

<210> 239
 <211> 621
 <212> DNA
 <213> *Candida albicans*

<400> 239
 tcagatggtg atgaactgtc gattgaattt cttaacaaa gaagcaaac tccattaaca 60
 caaggaactt ataattatca taatacttct actaattcac ttaatttoca acaaccagaa 120

ccaatttata gtaatcaaac tcgtacatct ttaagtgatt cttattatga tcatcccata 180
 ttgacactt ctcaaacaca gatccaacct ccacatgata atccattcac tgaaagttat 240
 gaaatgacag atacttcata tcaaggtaat gatcatcatt atcgtactgg tcaacctaata 300
 catctcatga accccactta taaccaagct ttcattcctc atgtttatga tgaagaagat 360
 aatgatgaac aagaatatga tcaacgtatt cagtataatc aatttcaagg ggalcatttt 420
 gatttggcag cgattagtta tgctgatgat gaaagtcaaa gtcagttgga ctatgtcccc 480
 actgaacgtg tcatacctga aggagaggaa gaagaagagg aaggtagagac gagttttgaa 540
 aaagaacctg gtagtgaaac catttctggc ccatttggag aagaacgatc atttgaagaa 600
 cctcctccac aacaagaagt c 621

<210> 240
 <211> 607
 <212> DNA
 <213> Candida albicans

<400> 240
 aactagggct gctaattgtg cactgaatt aactgctgct gcaccttatg aattgggtaa 60
 attatattat aatggatttg aagatattgt cttgattgat aaaaaatatg gattagaatt 120
 atttgctcaa gcagcagcat taggtcattt acaatcagcc gccattttgg gtcattcata 180
 tgaaattgga gaaattgttc ctcaagattc taatttatca attcattatt atactcaagc 240
 agcattagga ggtgatccaa attcaatgtt ggcaatgtgt gcttgggtatt tagttggtag 300
 tgaaccatat ttacctaaag atgataatga agcatttgaa tgggctaaac gtgctgcaa 360
 ttgtaattta ccaaaagctc aatttgcttt agcaaatttt tatgaaaaag ggattggatg 420
 tattaaaaat attaatgaag ctcaatcatg gtataaaaaa gctgctgaaa atggtgatga 480
 aaaatctttg aaacgattaa ctgataaaga attgggttaa accattcaaa aacaatggaa 540
 aaagaaacct ccagtaattc ataataaga tggaacttct acaactaatt caggatctct 600
 tgctcaa 607

<210> 241
 <211> 693
 <212> DNA
 <213> Candida albicans

<400> 241
 agtcagagca ggttcaatca tcaaaatcag atgtgatcaa gatttcgata gtgaaaaaga 60

agaggcagag aaatttacca aaattcagga tgagatttta caaacatttg ctacaaattt 120
 gccacaacca ccaaatttga aaatcaagaa cgttactcaa acctcgtgtg ttttagaatg 180
 ggataaacta aacttgggca cgcacacatt gaaaaatctt attttattca aagatggtaa 240
 aaaattaggc tcaattcctc agccattaaa taatcgaacc tcaaaattgt ctggattgcc 300
 aattgacaaa tcttttaaag tacaattacg tttggatacc actgctggta ctttcttgtc 360
 gaatgaaatt gaggtaacaa cccacaaaat gactgatttg tcaggaatta ctgtgtgtct 420
 tggtgacctt acacctaattg atcaattcaa caaggaggac attgaagagg cattaaagaa 480
 tatgggggca aaatatccag tgcaacaaca agtcaaagtc gacactacac atttcctctg 540
 tactagagaa aacaaacaaa atcctgaata tgtgaaggca aatgatatga acattccaat 600
 aattagacca gagtgggtga aagcctgtga gagagaaaga agaatagttg gtgtagaga 660
 cttttatgtg aaagattgtg tcttaccoga cat 693

<210> 242
 <211> 511
 <212> DNA
 <213> *Candida albicans*

<400> 242
 gtcaacaaca aggcaagaca attttacttt cacttggagg agccacgggc aattacgggt 60
 tttcttccga ctcagaagca gttcaatttg caggaacatt atggaataaa tttggagggtg 120
 ggaaagactc agaaagacct tttgacgatg caattgttga tgggtttgat tttgatattg 180
 aaaataaaga ccagacagggt tatgctgctt tagcgactca attaagaaaa tatttttagca 240
 ctggaactaa atcttattac ttgtcagctg ctccacaatg cccataccct gatgagtcgg 300
 ttggtgactt aatgtcccaa gttgatttag attttgcatt tatacaattt tataacaact 360
 actgttcgct caatcagcaa ttcaactgga actcatggag caactatgcc agaggtaaaa 420
 gtattaaact ttatttgggc cttcctggct catcatcgtc tgctggctcc ggatttgttg 480
 gtttgtcgac tgttcaaaga gtcgtggcta g 511

<210> 243
 <211> 510
 <212> DNA
 <213> *Candida albicans*

<400> 243
 ctgtcaagaa actgacgttg acattgtttt attgtcattc ttgaatttgt ttccagatcc 60

attgaacggt aattttgcca accaatgtgg taacactttt gaatctgggt tgttacactg 120
 ttctcaaatt ggtgctgaca tcaaaacttg tcaatcttta ggtaaaaccg tgttggtatc 180
 tttaggtggt ggtgttggtg actatggttt cagcgatggt gcttctgcca ctaaattcgc 240
 agacaccttg tggaacaaat tcggtgctgg tgaagatcca gaaagaccat ttgatgacgc 300
 tgttggtgat ggtttcgatt ttgacattga acacgggtgg gctactgggt accctgaatt 360
 ggctactgcc ttaagaggca agttcgccaa agacacttcc aaaaactatt tcttatctgc 420
 tgctccacaa tgtccatacc ctgatgcac tcttggtgat ttattatcca aagtcccact 480
 tgattttgca ttcaccaat tctacaacaa 510

<210> 244
 <211> 577
 <212> DNA
 <213> Candida albicans

<400> 244
 ttggctcgat taagaaataa attaaattca aaatatatta tcacggtagc ggctcctggt 60
 ggtagtata atattgaaat tttgaagatt caagaaatgg ataaatattt gacattttgg 120
 aatttaattg gttatgattt tgctggtgaa ggctggtcct cgaaaaactgc tttccattct 180
 aatttatattg gtaataatgg ggataattca ttgaatgcat ctgatgttgt ccaaacttat 240
 attaacaagg gagttcatcc aacaaaattg atattaggga tgccaatgta tggaagaata 300
 tttcatgggtg ttgatcgacc agaaattggt attcctttta caaaagagag aaaatcagggt 360
 tgtatagaag ctgatgttgt ggactataac aaatttggtg atacattcga ttatgaagat 420
 tttgatccac gcaaagtggg tgcattgaaa tatgattccc atagtaagca attaattaca 480
 tttgataatc ccagtggtgc tagaataaaa gctagctttg tacaactgag acaattgggt 540
 ggtgggatgt ggtgggattc tgctggtgat gtttcag 577

<210> 245
 <211> 909
 <212> DNA
 <213> Candida albicans

<400> 245
 gctccatcta gcaactcatc tgggtgtcca gctgcgccat ctaacaattc atctggtgct 60
 tcagttgttc catcacaatc agccaacaat tcatctgctt cagctgctcc atctaacaac 120
 tcatctagtg ctatttctgg aagtgttgca ccatcaagct acggaaactc taccattgca 180

caaccatcta cttctacaaa atccgatgct gcatcaatta ctggccaat tactacagac 240
 aagggtataa ccaatgagtc tggcattgct tttacatcta cagtaatcat tacacatggt 300
 tctgaatatt gtgaccagac ttctgctgct gctgttcaat catcagcatg tgaagaacag 360
 tcaagtgcta aatcagaaca agcttctgct tcatcagaac aagttaaggt cactactagt 420
 gtggttttgt gtgagtcac tattcaatct attgaatctg tcaaaacaag tgcagaagct 480
 gtcataaga ctgaggttat tgctagtgt gcaagtgaat taagctcttt gagttctgct 540
 aaatctgaag ctatgaagac tgtttctagt ttagttgaag ttcaaaaatc tgcagttgcc 600
 aaacaaacct cggttgctgc tgtacaatca tctgctgctt ctgtacaatt aagtgctgct 660
 caccgcaaaa agtcgtctga ggcagttgaa gttgccaaa ctgctgttgc tgaagcttct 720
 aaagctggtg atgaaatttc gactgaaatt gttaacatca ccaagacagt ttcttctggt 780
 aaggagactg gtgtttccca agctactgtt gctgctaaca cacattcagt tgctattgct 840
 aatatggcaa ataccaagtt tgccagcaca atgtcgttgt tggtcgctag ttctgtgttt 900
 gttggtctc 909

<210> 246
 <211> 537
 <212> DNA
 <213> *Candida albicans*

<400> 246
 gacactccgt cagattcaac tccaactaaa aaaccagaac cgactataag tccagagttt 60
 agaaaaccca gcataagtct gttaacttct ccaagtgttg cacataaacc tccgccacta 120
 ccaccgtcac tgagtcctgg tggagtagt gagcattcga gtgcaagatc gtccccggct 180
 atcacgaaga gaaactcgat tgcaaacatt atcgatgctt atgaagaacc agctactaaa 240
 actgaaaaaa aggtgagct aaactcacca aagataaacc aactgacacc ggtgccaaag 300
 cttgaggaac acgagaatga tacaacaaa gtagaaaagg ttgtggatag tgcacctgaa 360
 ccaaaaccaa aaaaggagcc tcaaccagtt ttgacgacc aagacgatga cttgacaaaa 420
 atcaaaaagc tcaagcaatc taagaaacca cgtcggtatg aaacacctcc aatttggggc 480
 cagaggtggg ttccccaaa tagacagaag gaggaacta atgttgatga cggaat 537

<210> 247
 <211> 561
 <212> DNA
 <213> *Candida albicans*

<400> 247
acatagtcag ccacaaccac aaccacaagc aacacaacca agatcaaata gaagtagact 60
gcaaacgagc ttttctaaac caagaggtag caggcaagtt agtggcagtg gcaggtcaac 120
cggggcccaag aaacaatcag caatcacact gggcagtact ggtactggcc ctgcccgaac 180
tgctgatata ggtatgacat cagttgctaa tagcacttcc acaaccacta tgacaaccac 240
caacaataac aacaaattgt ctgtttcagc ccagtaaat gtgatatatg ctaatcttcc 300
tgagagactt caacaggtgt taccagcacc gccgttatca cgtgctccag taagacctga 360
tgtaacggtc aatttgacat caaacgagc caaaagaaaa tcaaaattca ctccggaaca 420
agatgacatg atcgtgaatt tgaagaaaaa ggggaaatca tgggttgaaa ttgccgaaat 480
cactggtggt ggatcatatt tagcggcagc gaatcgattt caagttattg ttggacagca 540
aggaaataac aattcgagtg c 561

<210> 248
<211> 351
<212> DNA
<213> Candida albicans

<400> 248
tcaagaaagc tactgatggt ggtccacacg gtgctatcaa tgtctctggt tctgaaaaag 60
ccattgacca atctgttgaa tatgttagac cattaggtaa agttgttttg gttggtttac 120
cagctcacgc taaagtcact gctccagttt tcgatgctgt tgtcaaatcc attgaaatca 180
aaggttctta cgttggtaac agaaaagaca ctgctgaagc tattgacttc ttctccagag 240
gtttaatcaa atgtccaatc aagattgtcg gtttatctga cttgccagaa gtcttcaaat 300
tgatggaaga aggtaaaatc ttgggtagat acgtcttgga caccagtaaa t 351

<210> 249
<211> 707
<212> DNA
<213> Candida albicans

<400> 249
ctcagtcctt tgctacaacc actacagtta ctgctcctcc aggtggtacc gatactgtga 60
ttatcagaga gccaccaaac catactgtca ctactactga atattggtca caatcctttg 120
ctactactac tactgttact gctcctccag gtggtactga ctcagtaatt atcagagAAC 180
caccaaattcc aactgtcact acaaccgagt attggtctca atcctttgct actactacta 240

cagttactgc tctccaggt ggtactgact cagtaattat cagagaacct ccaaacccaa 300
 ctgtcaccac cactgaatat tgggccaat cttacgcaac cacaactact gtgactgctc 360
 ctccaggagg cactgactca gtaattatca gagaaccacc aaaccacaact gtcactacta 420
 ctgaatactg gtcacaatca tatgccacca ctaccactgt aactgcacca ccaggtggta 480
 ctgacactgt tatcattaga gagccaccaa accacactgt cactactact gagtattggt 540
 ctcaatcggt tgctactacc acaactgtaa ctgggtccacc aagtggcact gatactgtta 600
 tcattagggg accaccaaac ccaactgtca ccactactga atactggtct caatcatatg 660
 caaccactac taccattacc gctccacctg gtgaaactga taccgtt 707

<210> 250
 <211> 586
 <212> DNA
 <213> Candida albicans

<400> 250
 aacggtcata tccaaagaag ttactggtgt tttcaaccaa ttcaattcat tgatatggtc 60
 ttacacatac agagctcgat acgaagaaat atctactctt accgctaattg ctcaattgga 120
 atgggctttg gatgggtacta ttgccagtcg cggtgataca tttacattag tcatgccctg 180
 tgtatataaa ttcatgacgt acgaaacctc agtgcaatta actgccaaact ctattgcata 240
 tgccacatgt gactttgatg ctgggtgaaga cactaaaagt ttttcaagtt tgaagtgtac 300
 ggtgactgat gagttgacag aagataccag cgtttttggg agtgttattt tgcctattgc 360
 tttcaatggt ggaggttccg gatctaaatc tacgataaca gactccaaat gtttttcaag 420
 tgggtacaac actgtcacgt tttttgacgg aaacaatcaa ctttctacaa ctgcaaattt 480
 tcttccccga agagaactag cgtttggtct agttgttagt caaagacttt ccatgtcgct 540
 cgatacaatg actaattttg ttatgtctac accttgtttc atgggt 586

<210> 251
 <211> 692
 <212> DNA
 <213> Candida albicans

<400> 251
 aacattagaa acggaacagg ccgtcctcgt aagactccca gatccaagct ctatatggtt 60
 taccctccac tttcagggtg ggactcaaca aatcctgaac cagaagaggg tagttcacag 120
 gaaaacaatc ccacagaacc tagttcctca caatcaaatt cagtacaaaa tcaagaccaa 180

agtgaagacc agagtcaact accacaacaa gaactgaata cacaacaaga gctgaataca 240
 caacaagaac tgaatacgcc atcaccagg gcgtcaaaca catcaactga aactcctgct 300
 cctttaagtc ccatacaacc aggaattoga aatattcctc tgggattatt attaccacaa 360
 gaaaaagttg gccgtcttat gggatatcca tttaccgcg attttaattt taccctaaat 420
 ccagagagat atcagaaact tatttatgtg ttccagatac ttaaaaatgc tgctcgtaat 480
 cacagaaatg gagcttctct acttagaaag tatttcctgt tagcgagaag gtctaaaaga 540
 acaacagaca tgtttgtaac caccatagag gaaatgcgga agaggctgtt ggaaaatagt 600
 cgtaagagag agctcgagga agcgcaagaa aggggaagagt caaataaaaag acaacataca 660
 gaatcaagtg cagaaccaa tgcagaactg ag 692

<210> 252
 <211> 506
 <212> DNA
 <213> Candida albicans

<400> 252
 caaagttcca ccatttcaac tccagtagac tcattaccta caagtggaag aagtactcct 60
 aatccgaatg catcaaccac ttcatataca tcattgaata ctgctcttgc taaattaaat 120
 gtttccaata ttccatttga agaaaatttg agtaatatg agaaagccgg taagatagct 180
 gagattagac ccgaagtggg aaccattgtt aagataattg atgaacaaga agatttatgc 240
 attattaatg aatggaaatt gaatgaaatt ttgaaatctt tattgaaacc taaaagtcct 300
 gcattagtta aagaaggagc ttattataac attcaacaat tggcaactaa atttggtggt 360
 caaaccccca aagaagctta ttattacag tttttaagta ctgcttatga tatgtttact 420
 gataaagata aaaatgttgt taaagctgct aaatctgcta ctgatgcatt atttgggaatt 480
 taccctgtgg aagcattagg atcaat 506

<210> 253
 <211> 520
 <212> DNA
 <213> Candida albicans

<400> 253
 atcgacatca acaggcttac cacctaattg gacgattaga gtatccagat ccataacaa 60
 agagtatttc ttaaaccaat ctaccaatga gtcgtcttgg gaccacctt atggcactga 120
 caaagaagta ttgaatgcat acattgcgaa gtttaaaaac aatggttaca agccacttgt 180

gaatgaggat ggccagggtta gagtttctca tttgttgatc aagaacaatc aatcaagaaa 240
 acccaagtct tggaagtccc cagatggtat aagtagaact agagacgaat ctatacagat 300
 attgaagaaa catttggaag gaatattgag tggtagaggtt aaactaagtg aattggcaaa 360
 taccgaaagt gattgcagct cacatgacag aggtggtgat ttagggtttt ttagcaaagg 420
 acaaatgcaa ccaccattcg aagaagccgc attcaatttg catgttgag aagtcagtaa 480
 cataattgaa accaatagtg gtgtccatat cctccaaaga 520

<210> 254
 <211> 507
 <212> DNA
 <213> Candida albicans

<400> 254
 caatagcaca ggcacaatct ggaactggta aaactgctac ttttctatt ggtatgcttg 60
 aggttataga tactaaatca aaagagtgtc aagcacttat cttgtctcct actagagagt 120
 tggcaattca aatacaaaat gtggatcatgc atttaggaga ttatatgaac attcacaccc 180
 atgcctgtat tggtagggaaa aatgtcgggtg aggatgttaa gaaattgcag caagggcaac 240
 aaatagttag tgggacacca ggtagagtga ttgatgtgat aaaaagaaga aatctacaaa 300
 ctagaaatat caaggttctt attttagatg aagctgatga actttttaca aaagggttta 360
 aagaacagat ctacgaaatc tacaacatt taccaccttc ggttcaagta gtagttgtta 420
 gtgccacttt gccacgtgaa gtattggaga tgacaagtaa gtttaccact gatccagtga 480
 aaatcttggt gaagagggat gagattt 507

<210> 255
 <211> 535
 <212> DNA
 <213> Candida albicans

<400> 255
 ttcatcaca ccagccttac cacaagataa actcacgggt gtagatgata tccctgatag 60
 agaacttacc gatattgaaa gaatcaacat caatgctgcc aattccaatt tacaagaaa 120
 attgaaaaca agacatttac aaatgatcgc tattggatca tctataggaa ccggtctttt 180
 cgttggtact ggtggtgcat taagtactgg tggaccagct gccattgttc tagcatgggc 240
 cataagtgtc atatcggtat ttatgacaat gcaaggatta ggtgaattgg ccgttgcat 300
 ccagtttct ggtggattca atttatacgc aagtaaattt ttagaaccag gtattggatt 360

tgctgttggt tggaattatt tcttacaatt ctttgtatta ttgccattag aattagttgc 420
 tgggtgctata actatcaaatt attggaatgc tagtataaat tctgatgtgt ttgttattat 480
 attttggttt gtgggtgcttg tgatcaccat gttgggtgta agatggtatg gtgaa 535

<210> 256
 <211> 433
 <212> DNA
 <213> Candida albicans

<400> 256
 cacaaggta tacattcaga aaactaaaac ttactgatta tgataatcaa tatttagaaa 60
 ctttaaaagt tttgacgaca gttggtgaaa tttccaaaga agatttcact gaattgtata 120
 atcattgggc ttcatgcca tctatttata atccatatgt aatcaccaat gcatcaggta 180
 tagtggtagc cacggggatg ttatttgtgg agaaaaaatt gattcatgaa tgtggtaaag 240
 ttggtcatat tgaagatatt tcagttgcta aatctgaaca aggtaaaaaa ttgggatatt 300
 atttagtcac ttcattaacc aaagttgctc aagagaatga ttgttacaaa gtcattttag 360
 attgttctcc tgaaaatggt ggcttttatg aaaaatgtgg ttataaagat ggtggtgttg 420
 aaatggtatg tag 433

<210> 257
 <211> 540
 <212> DNA
 <213> Candida albicans

<400> 257
 aaaccataaa tcaacaacca cttgcttcgt caagatgggc tgcttgtgcc attggtgggtg 60
 ttcttgcctc atttattcaa attcttgcca cacttttcga atggattttc gtgcctagag 120
 aatgggcccgg tgctcaacat ttgagtcgtc gtatgctatt tttggtgtta attttcttac 180
 tcaatttggt tccaccagtt tatacattcc aaattaccaa attggtgatt tattcgaaat 240
 cggcatatgc tgtgtcgatt gttggatttt tcattgctgt ggccacttta gtattctttg 300
 ccgtcatgcc attgggtgggt ttattcactt catatcatgaa caagagatca agaagatata 360
 ttgcatcaca aacatttact gccaaactaca ttaaattgaa aggttttagat atgtggatgt 420
 cttatttggt atgggtttttg gttttccttg ccaaattgggt tgaatcttat ttcttctcga 480
 ctttgtcttt aagagatcct attagaaaact tgtcgacat gacaatgaga tgtgttggtg 540

<210> 258

<211> 574
<212> DNA
<213> *Candida albicans*

<400> 258
tattatggcg attccacaga gttgatattg gtgatatcac aaatatggaa cagcattatc 60
atttccatgt acagggagca tgttctctcg gttgaacaag tttgcaagtt gatttatcaa 120
cgaggagctg atgaaaacac tatacgacca ccactatttt ttgtttacga agatgataac 180
aaattttatg attttattaa aatcgaaaag gaatgggaaa gaaggatcac attttttgct 240
caatcgttat caagcccttt accagaacca tttccagtag tttctacacc aacatttacc 300
gttttgattc ctctactctc agaaaaata ctattaagtt tacaagattt aattaaagaa 360
caaagctttt caaaactaac gttgctagat tatttgaaac aacttcattc gaaagaatgg 420
gattcatttg ttcaagatag taagatgatc caaactataa aggaaatgga tgaagacaag 480
tttgtacgcg aaaatatgga tgatttgccg tactactgta tcgggttcaa agattcttca 540
ccagaaaatg ttttacgaac aagaatttg gctg 574

<210> 259
<211> 506
<212> DNA
<213> *Candida albicans*

<400> 259
cgtttggtat ttgctgttcc taaaaagggc agattatacg aaaaatgctg taacttattg 60
agtggtgccg atatacagtt tagaagatct aatagattag atatagcact ttctacaaac 120
ttgccaatg cattaatctt cttgcctgca gctgatatcc cagttttcgt tggagaaggc 180
aattgtgact tgggtataac tgggttagac caaatcaaag aagctgaaca attcgacaac 240
atcgaggact tgttgattt gaaatttggc tcatgcaaat tgcagatcca agttccagca 300
gatggcgagt acgaaaagcc agaacagctt gttggaaaga aaattgtgtc ttcatttaca 360
aaattgagta ccgactatct caaacaattg tcagacaaac ctactaatat cagatatgtc 420
ggtggttccg ttgaggettc ttgtgccttg ggtgttgctg atgctattgt cgatttggtt 480
gaaagtgggtg aaactatgaa agcagc 506

<210> 260
<211> 539
<212> DNA
<213> *Candida albicans*

<400> 260
agctaaatcc aaagacgatg acgcatcggc atatgtcggg gtcgggtcca tcgctgctgg 60
tggccgttac gacaatttag tgggtatggt ctccaacggg aaatccatcc cttgtgttgg 120
tgtatcgttt ggtgttgaga gattattctc catcatcaag aaccgtgcca atctcaacaa 180
catctccgcc aaccacactg acgtgtttgt tatggcattt ggcggcggcg aaggctggaa 240
cgggttctta aaagaaagaa tggaaatcac caacaagtta tggaaagctg ggatcaacgc 300
cgagtacttg taaaaatcca aagccaacat tcgtaaaciaa ttcgatgccg ccgaaaaggc 360
cggcgccaaa ttagctgtca ttcttggtta agaagagtac ccacaaggcc aattacgaat 420
caaagtgttg ggccagggag aggaaaacga aggtgagttg gtcaccaaag atgaactact 480
tgctgctgtc caggccaagc tcagctctga catcgacgac atttctcgca taatcaagg 539

<210> 261
<211> 1030
<212> DNA
<213> *Candida albicans*

<400> 261
gctaccactc caaacacttc tggtccaaca acttcttcag aatcaactac tccagctact 60
agcccagaaa gttctgttcc agttacttct ggatcatcta ttttagctac cacttcagaa 120
tcatcatctg ctccagctac tactccaaat acatctgttc caaccactac tactgaaacc 180
aaatcatcaa gtactccatt aactactact actgaacatg atacaactgt tgtcactggt 240
acttcatggt ctaacagtgt ttgtaccgaa agtgaagtta ctactggtgt tattgtcatc 300
acatctaaag atactattta caccacttac tgtccattga ctgaaactac tccagtttct 360
actgctccag ccactgaaac accaactggt acagtatcca cttctactga acaatcaact 420
actgttatta ctgttacttc atgttctgaa agctcttgta ccgaatctga agttactact 480
ggtgttggtg ttgttacttc tgaggaaact gtctacacta cattctgtcc attgactgaa 540
aacactccag gtactgattc aactccagaa gtttccattc cacctatgga aacaattcct 600
gctgggtcag aatcatccat gcctgccggg gaaacctctc cagctgttcc aaaatcagat 660
gttccagcta ctgaatcagc tccagttcct gaaatgactc cagctgggtc acaaccatct 720
attcctgccg gtgaaacctc tccagctggt ccaaaatcag atgttccagc tactgaatct 780
gctcctgtc ctgaaatgac tccagctggt actgaaacta aaccagctgc tccaaaatca 840
tcagctcctg ccactgaacc ttccccagtt gctccaggta ctgaatccgc accagctggt 900

ccagggtgctt cttcttctcc aaaatcttct gttttggcta gtgaaacctc accaattgct 960
ccagggtgctg aaaccgctcc agctggctca agtgggtgcta ttactattcc ggaatctagt 1020
gctgtcgtct 1030

<210> 262
<211> 528
<212> DNA
<213> Candida albicans

<400> 262
ttgggtgggtt agaagttgag aaagggtgctt ctttatttat taagctggac aatggtcctg 60
tcttagctct taatgtcgtt ttatcaactt tagttagacc agttataaat aatgggtgta 120
tttcattaaa ttctaaatct tctacaagtt tttcaaattt tgacattggt ggatcttcat 180
tcactaataa tgggtgaaatt tatcttgatt cttcgggtct tgttaaaagt acagcctatc 240
tttatgcacg tgaatggact aataatgggt taattgttgc ttatcaaaat caaaaagctg 300
ctggtaatat tgcttttggg actgcttata aaaccatcac taataatggc caaatttggt 360
tgcgtcatca agactttggt ccagctacaa aaatcaaagg tactggttgt gttactgctg 420
atgaagacac atggattaaa cttggtaata ctattttatc agttgaacct actcataatt 480
tttacttgaa agatagtaaa tcgtctttga ttgttcatgc tgtttcaa 528

<210> 263
<211> 528
<212> DNA
<213> Candida albicans

<400> 263
caagagaaag ggaaagaaga gaaaaaggac acagccttcc aaacatcttt tgatagaaat 60
tttgatcttg ataattcaat cgatatataa caaacaattc aacatcagca acaacagcca 120
caacaacaac aacaactctc acaaaccgac aataatttaa ttgatgaatt ttcttttcaa 180
acaccgatga cttcgacttt agacctaacc aagcaaaatc caactgtgga caaagtgaat 240
gaaaatcatg caccaactta tataaatacc tcccccaaca aatcaataat gaaaaaggca 300
actcctaaag cgtcacctaa aaaagttgca ttactgttaa ctaatccga aattcatcat 360
tatccagata atagagtcga ggaagaagat caaagtcaac aaaaagaaga ttcagttgag 420
ccacccttaa tacaacatca atggaaagat cttcttcaat tcaattatcc tgatgaagat 480
acaaatgctt cagttccacc aacaccacca cttcatatga cgaaacct 528

<210> 264
 <211> 360
 <212> DNA
 <213> Candida albicans

<400> 264
 cgttaactca gtcataact acattttatt cctttttgca tcaacaatcc ttgcggcaga 60
 taaaacgtcc agttcagtat cacctacttt agtatgggtc acaggtactg atgccaatgg 120
 gaaattagcc accaccaat caacatatta tcaaagcttt atgagtactt ataccacagc 180
 tgaaaccca tcgtctggtt ctattggatt ggggtcaatc agtgaacag taggagaaat 240
 cagaacttat agtatgacta ctatatcaca aggtaatggt gggttatcaa aattcaatca 300
 aatgggttta gaaatgaaga atttgtcatt tgttaaatta attggggttt cttttattgc 360

<210> 265
 <211> 701
 <212> DNA
 <213> Candida albicans

<400> 265
 gatccagatg ctgtaaccac agccaatgga acattaaatt tacgtatgga tgcttataaa 60
 aatcataatt tattctatcg ttcaggaatg gtacaaagtt ggaatcaatt gtgttatact 120
 caaggtcatt tagaaattct ggctcgttta ccaaattatg gtaatgtaac agggttatgg 180
 cctgggttat ggtctatggg gaatttaggt agaccagggt atttgggatc tactgatggg 240
 gtatggccat attcttacga ttcattgtgat gccgtatta cacctaatac atcttctcct 300
 gatgggattt cttatttacc aggtcaaaga ttaaataaat gtacatgtcc aggtgaatta 360
 catcctaata gaggtgttgg tagaggtgcc cctgaaattg atgttattga aggtgaagtg 420
 atgactgata gtagtggtta aaaagaaaat tgtgggtgtg cctctcaatc cttacaattg 480
 gccctatgg atatttggtt tattcctgat tataattggg tggaatcta caatttttca 540
 gtttcaacga tgaatactta tactgggtga ccattccaac aagcattatc agcaacaacc 600
 atgttgaatg ttacatggta tgaatttggt gataatgccc ataatttcca aacttatggt 660
 tatgaatatt taaatgaccc tgaacgggt tatttacgat g 701

<210> 266
 <211> 794
 <212> DNA
 <213> Candida albicans

<400> 266
 taatttccct tgttgtttcc ataataagat gtgttgttgc agatgttgac atcacatcac 60
 caaagagtgg agaaactttt tctggtagtt ctggatcagc aagtatcaag attacctggg 120
 atgattcaga cgattcagac tcaccgaaat ctttggataa tgccaaaggg tacacaattt 180
 ctttatgtac tggacctact tcagatgggg atatccagtg tttggatcca ttagtcaaga 240
 acgaagctat tgcaggtaaa tctaaaacag tttctattcc ccagaactca gtacctaatg 300
 gttattacta tttccaaatt tacgttactt tcactaatgg aggtaccact attcattatt 360
 caccacgttt caaattgact ggtatgtctg gtccaactgc cacttttagat gtcaccgaaa 420
 caggatcggg gccagcggat caagcttcag gatttgatac tgcaactact gccgactcca 480
 aatctttcac agttccatat accctacaaa cagggaagac cagatacgca ccaatgcaaa 540
 tgcaaccagg taccaaagtg actgctacaa cctggagtat gaagttccca actagtgtctg 600
 ttacttacta ctcaacaaag gctggcacac caaatgtggc ctctactatt accccagggt 660
 ggagttatac tgctgaatct gccgttaact atgctagtgt tgctccatat ccaacatact 720
 ggtatcctgc cagtgaacga gtgagtaagg ctacaattag tgctgtaca aagagaagaa 780
 gatggttgga ttga 794

<210> 267
 <211> 654
 <212> DNA
 <213> Candida albicans

<400> 267
 acattcattg ggttcatctc cagaaaacaa taatgccctg ggtccattaa gtggagttcc 60
 aactccatca ttttctaatt tgaatgatta tttccaacaa aaaagtaaca gcaataattc 120
 tcgattatth aatgctagtt catcatcatt gagttcatta agtggaaaaa taagatcttc 180
 ttcacgact aatttagctg gtttacaag attaaactcca ttaactagta ctacaaacaa 240
 tacaacaaac acaacaacat ctaatactaa taataataat atgacaaaac caagtataat 300
 accaaaacaa ccatcttcta catcattaaa tttagaatth tataatggca acaatcaaca 360
 acaacagaat tatcatatcc ataagaaatc tcgaccaaatt tcaccatcac aaacccaat 420
 tcatttatca agttcacgta aaagcgctaa taatctgtth ataatatcac ctaatgaaac 480
 cccattacaa actccattac aatcaccaca attaaaacca tatcaagatc aaccaccaac 540
 taatgtcaat atcaacgtta gtgcaccatc agatacatth attggaactg ctgttactga 600

aaaattaaat aatattagta gtattgctgg taatggaaca caattaccac caat 654

<210> 268
 <211> 529
 <212> DNA
 <213> Candida albicans

<400> 268
 tgtcccagaa agtgctaaac acattttcaa ccaagaaact ttagcatttg ttgccacttt 60
 gcaccgtggt ttccaagcca gaagacaaga attggtgaac aacagaaagg aacaacaaaa 120
 attaagagat caaggtttct tgccagattt cttaccagaa actgaatata ttagaaatga 180
 tgctacctgg actgggtccac cattggctcc aggttttagtt gacagaagat gtgaaatcac 240
 tggccaacc gacagaaaaa tggttatcaa tgccttgaac tccaatgttg ctacttatat 300
 ggccgatttt gaagattcat tgaccccagc ttggaaaaac ttggttgaag gtcaagtcaa 360
 tctttacgat ggtgtcagaa gaaacttgac tgctaacatt aatggtaaaa attatgcctt 420
 gaacttgac aaaggtagac acattccaac gttgattgtg agaccaagag gatggcattt 480
 ggatgaaaag catgtattgg ttgacggtaa accagtttcc ggtggtatt 529

<210> 269
 <211> 647
 <212> DNA
 <213> Candida albicans

<400> 269
 ttagctcatc aacatcatca acataaagaa gaaaaaagag ctgttcatgt tgttaccacc 60
 accaatgttg ttgttgtcac cattggtaat ggtgatcaaa ctaccacttt tgctgtcca 120
 tctgtagctg ctgattctag tgtagtggt tctgtcaaca ctgaaccacc tcaaaatcac 180
 ccaactacta ctcaagatgt tgcttctgct tctacttata catcttccac tgatggttct 240
 gccgcttctt cttctgctgc cgcttcttct tcttctcaag ctggttctga accttctggt 300
 ggtgttggtat ctggtggtgc taaagggtatt acttattctc catacagtga caatggtgga 360
 tgtaaatcat catctcaaat tgccagtga attgctcaat tatctggatt taatgtcatt 420
 cgtttatacg ggggtgattg tgatcaagtt gcagctgtat taatagctaa aacttcatct 480
 caaaaaattt tcgctggtat tttcgatggt tctagtatta catctggtat tgaaagttaa 540
 gctgaagccg ttaaaagtat ttgcggtagt tgggatgata ttacactgt ctctattggt 600
 aatgaattgg ttaatgctgg ttctgccact ccaagtcaaa ttaaagc 647

<210> 270
 <211> 636
 <212> DNA
 <213> *Candida albicans*

<400> 270
 actgtcgttt ctggtcattc tggtaaagat acttcctctt ctaaatacaac tgttgccgaa 60
 tacactgggg ttgaagaaat cactaccacc ttgaattatg actatttagt tgttggtggt 120
 ggtgctcaac catctacttt cggatttcct ggagtcgctg agaattcaac ctttttgaaa 180
 gaagtcagt atgcttctgc tattagaaga aaattgatgg atgttattga agctgccaat 240
 attttaccta aagatgaccc agaaagaaag agattattgt ccattgttgt ttgtggaggt 300
 ggaccaacgg gtgttgaagc tgctggtgaa atccaagatt atattgacca agatttgaag 360
 aaatgggttc ctgaagttgc cgatgaattg aaagtctcct tgggtggaagc ttaccaaac 420
 gttttgaaca catttaacaa gaaattgatt gactatacca aagaagtttt caaagacact 480
 aatatcaatt tgatgactaa taccatgatc aaaaaagtca atgataaaag tttgattgca 540
 aaccataaaa accctgacgg atctactgag tctattgaaa ttccatatgg tcttttaatt 600
 tgggctactg gtaatgcacc aagagatttc actcgt 636

<210> 271
 <211> 666
 <212> DNA
 <213> *Candida albicans*

<400> 271
 ggtacgaaca gacaaacacc tgaagaaact gacattggta tgattgocca ttattttgaa 60
 aaataccagt ttgacgggtt aattattggt ggaggttttg aagcatttgt ttcgttagag 120
 caattggaaa gatcaagagc tatgtatcca tcgttcagaa ttcctatggt tttaatccct 180
 gccaccattt caaataatgt tcctggtacc gaatattctt taggggctga tacctgtttg 240
 aattcgtaa tggaatattg tgacattgac aagcaatcag cttcagctac cagaggtaca 300
 gcatttatta ttgatgttca aggaggtaat tccggataca ttgccacatt tgcctcatta 360
 atcagtggag cacaagcatc ctatgttcca gaagaaggta ttccattaca gcaattggaa 420
 atggatatca attcattgag agaagcattt gccgtggaac aaggaatgac aaagagtgg 480
 aaattgatca tcaagtcgag taatgcatcc aaagtaactaa cccacacac attggctgac 540
 atattcaacg atgaatgtca cggtgacttt gacactaaga cagctattcc gggacacgctc 600

caacaagggtg gattaccttc accaatagat agaagcagag gtgatagatt tgccattaga 660
gctggtt 666

<210> 272
<211> 588
<212> DNA
<213> Candida albicans

<400> 272
ttagccaagt ttgaatcgtc caccacacca gttgaagttg ttggtaacaa attttatttt 60
tccaataatg ggtctcagtt tttaatcagg ggtatcgctt atcagcaaga tgccgcgggc 120
tcagtttctt ccggttacga cgccgatcct aatagaaaat acaatgatcc tttagccgat 180
gctgacgctt gtaaacgtga cgtcaagtat ttcaaagaat caaacaccaa tactttgaga 240
gtttatgcta ttgaccaga taaggatcat gaagagtgtg tgaaaatttt cagtgcgct 300
ggtatttaca ttgttgctga tttatcagaa ccaactgtat cgattaacag aaacaacca 360
gaatggaact tggatttata caaacgttat acaaaagtca ttgataagat gcaagaatat 420
tctaattgtt tgggattttt tgctggtaac gaagtaacta ataatcgctt aaataccgat 480
gcttctgcat ttgttaaggc tgccattaga gatatgaaga aatacatcaa ggagtctgat 540
tatagacaaa ttcctgttgg ttattcatcc aatgatgacg aagaaatt 588

<210> 273
<211> 609
<212> DNA
<213> Candida albicans

<400> 273
tcaatcttgg ctgctacttc attcgtttct tccgtggctg ccgaagattt gcctgctatt 60
gaaattgttg gtaacaaatt cttctactcc aacaatggat cccaatttta catcaaagg 120
attgcttacc aacaaaataa cttggactcc aacgaatcat ttgttgaccc attagctaat 180
cctgagcact gtaaaagaga tattccatac ttggaagctg tcgactacga ctccaatgtc 240
atcagagttt atgctttaga caccagtcaa gaccatactg aatgtatgca aatgttgcaa 300
gatgccggtg tttatgtcat tgccgatttg tccaaccag atgaatccat caacagagac 360
gacccatcct gggatttgga tctttttgaa agatacactt ctgttgctga tttgttccac 420
aactacacta acattttagg tttctttgcc ggtaatgaag tcaccaacaa gaaatcaaac 480
actgacgctt ctgctttcgt taaggctgct atcagagata ccaaagccta catcaaaagc 540

aaaggttaca gaagtattcc agtcggttac tctgccaatg atgattccgc catcagagtt 600
tcattagcc 609

<210> 274
<211> 684
<212> DNA
<213> *Candida albicans*

<400> 274
attgggtatc aacaccattc gtatttattc aataaatgca cacctaaacc acgataaatg 60
catgaccatg ttggccaaag caggaatata cttgtttcta gacgtaaact cgccattgcc 120
acaccaccac ctaaaccgat acgagccgtg gaattcgtac aacttgtaact actttgaaaa 180
tgtctttaag gtggtagaac agttttccca ctacaacaac acgctagggt ttattgccgg 240
gaacgaaatt gtcaacgacc ccatctccgc cagtgtggct gcccataatg tcaaagcgg 300
ggtcgcgcaa atcaaaagct atatcgaata caatgcacca agaaccatcc ccgtcgggta 360
ttcagcggcc gacgacttga actatcgaat gccactagca cagtacctcg agtgtggcga 420
cgacaacccc aaagaatcag tcgactttta tggcgtcaac tcgtaccagt ggtgtggcga 480
ccagacattc tacagcagcg ggtacaacat cttggtcaac gattacaaac atttcaccaa 540
accaatgttt ttttcggaat atgggtgcaa tgaggtgttg ccgagaaatt tcgatgaagt 600
cccagtattg tacacaaacg atatgataga tgttttcagt ggcggattgg tatacagagtt 660
caccagga ccaaacaact atgg 684

<210> 275
<211> 532
<212> DNA
<213> *Candida albicans*

<400> 275
attagctgaa catgccagag accacacatt gagattcggg agcaaatcgc catttttcag 60
aaaatacttt ggaaatgaca ctgcaagtgc tgaggtcgtt ggtcattttg aaaatgttgt 120
cgggtgctgac aaatcatcca ttttgtttct ttgtgatgac ttagatgata agtgcaaaaa 180
tgatggctgg gctggctatt ggagaggttc caaccatagt gatcaaacta ttatttgtga 240
cttatctttt gttaccagaa gatacttata ccaactatgc tccggtggat ataccgtctc 300
gaaatctaag acaaacatct tttgggcagg tgacttgta cacagattct ggcacttgaa 360
atcgattggg caacttgta ttgaacatta cgctgacact tatgaggagg ttcttgaatt 420

ggctcaagaa aattcaactt atgctgtaag aaactcaaac tcattgattt attatgcttt 480
 ggatgtgtat gcatatgatg tgacaattcc cggcgaaggg tgcaatggag at 532

<210> 276
 <211> 506
 <212> DNA
 <213> Candida albicans

<400> 276
 gatttacacg cctcacaat tcaagggttt ttcgatgttc cagtagataa cttgtacgct 60
 gaacctagtg tggtagata catcaaggaa actattgatt atagtgaagc tataattata 120
 tcttctgatg ctgggtgtgc caagagagct gctggattgg ccgatagact tgatttgaat 180
 tttgaattga ttcataaaga aagagccaga gctaataag tatctcgaat ggttttagtt 240
 gttgatgtca ccgataagat ttgtgttatt gttgatgata tggcggatac ttgtgttact 300
 ttggctaag ctgccgaagt attgttagat aataatgcta aagatgtcat tgccattgtc 360
 actcatggta tattatctgg gaacgcaata aaaaatatca acaattctaa attgaaaaaa 420
 gttgtatgta ccaacaccgt tccatttgaa gacaaattga aactttgtct taaattggat 480
 acaattgata tttctgctgt tattgc 506

<210> 277
 <211> 606
 <212> DNA
 <213> Candida albicans

<400> 277
 taccacgata gctccatttc ccttagtggt tccaagaaca agagagaagc tgaaattgtc 60
 aatgaagatg gtacaattga aaagagaact tttggaagcg ctggtgtaaa tgccggtttc 120
 aatgccgcat ttgtcgtgtc taatgccaaa aaattatctg acggttctta tggattgat 180
 tgtaacttca agagtgttc ttctgtccaa ttgaacctgg cctttggtaa aaaagttaa 240
 caattgagta tcaccggtac tggttattct gatatttcat tattaggaaa tgttgctaat 300
 ccatttgaat ggtagcttc cttgaaagtc aaagcagaaa ttgttaaagg aaaatgttgt 360
 cttccatcag gtttcagaat cgttacagat ttcgaaagca actgtcctga atttgatgcc 420
 atcaacaat tttttggcag ttctcaaata atttacaag tcaatgccgt ttctaacgca 480
 attggtactt ttgatgttc tgcattatc aatgtcaag tcaaagcctt ccctgccaag 540
 agagaattag atgaatttga agaattaagt aacgatgggtg ttactcacag caagagaact 600

ttgggt 606

<210> 278
<211> 625
<212> DNA
<213> *Candida albicans*

<400> 278
gtgggtgttac tgttgggtgaa actgccaccg ttgctacaac tgttaccggt ggtgcaactg 60
tcactgggtgg tgaccaaggt caagatcaag ttcaacaatc agctgctcca gaagctggtg 120
atattcaaca atcagctggt ccagaagctg atgatatcca acaatcagct gttccagaag 180
ctgaaccacac tgccgatgct gatgggtggtg atgggtattgc aattaccgaa gtctttacca 240
ctaccattat gggcaagag attgtttatt ccgggtgtta ttacagttat ggtgaagaac 300
atacctatgg agacgttcaa gttcaaacc cactattgg ggggtggcggc tcccttcag 360
atgaccaata tcctacaact gaagtttctg ctgaggttag tccatctgct gttactactt 420
cttctgctgt tgctactcct gacgccaag tcccagactc tactaaagac gcttctcaac 480
ccgtgctac tacagctagt ggctcctct ctggtagtaa tgactttagt ggtgttaaag 540
atacccaatt tgctcaacaa atcttggatg ctcacaacaa aaaacgtgct agacatggtg 600
ttccagattt gacttgggat gctac 625

<210> 279
<211> 220
<212> DNA
<213> *Candida albicans*

<400> 279
aagagatgat cctcatacta ttgaagcctt gagacaacaa caacaacaac cagtctcaac 60
ttctgaaggt caacaagttg ctcaaagaat tgggtgctgct gattacttgg aatgttctgc 120
taaaaccggt agaggtgtta gagaagtgtt tgaagctgct actagagctt ctttaagagt 180
taaagaaaag aaggaaaaga agaagaaatg tgttgtcttg 220

<210> 280
<211> 531
<212> DNA
<213> *Candida albicans*

<400> 280
taagagagat ggccgtaaag agccagtacg tttcgacaaa atcactgcca gagtcaaaag 60
attatgttac ggtttgaatc caaaccacgt tgaaccagtt gctattaccc aaaaagttat 120

atcaggtggt taccaggggg ttactactat tgagttggac aacttggctg cagaaattgc 180
 tgctacaatg acaacaattc acccagatta cgctgtctta gccgctagaa ttgccgtatc 240
 aaatttacat aagcaaacca ccaaacagta ttccaaagtg tctaaggatt tatatgaata 300
 cattaatcct aagactgggt tacactctcc tatgatttcc aaggaaacct acgacatcat 360
 tatggaacac gaagatgaat taaactcagc cattgtttac gacagagatt ttaactacaa 420
 ttattttggg ttcaagactt tggaaagatc atatttggtta cgtatcaacg gtaaggttgc 480
 tgaaagacca caacatttga tcatgagggt tgctgtcggg attcacggta a 531

<210> 281
 <211> 453
 <212> DNA
 <213> Candida albicans

<400> 281
 ttttggacct caaatggacc agtatttgag agaaaaacta ttaagtgatg tggaaggtag 60
 atgtacaggt caatttggtt acattgtgtg tgttttggat tcaatgaata tagatgttgg 120
 caaggaaga ataattccaa gtactgggat ggctgaattt gaagtcaa atagagctgt 180
 tgtgtggaaa ccattcaaag gtgaagtggg agatgcagtt gtaacaaccg tcaataaaat 240
 gggatttttc gccgatgttg gccattatc agtgtttggt agtaccatt tgataccttc 300
 agatatgaaa tttaatcctt cagcaaacc accagcatat gtgagtcccg atgaaaacat 360
 tgaaaaggga tcgagggtta gattgaagat tgttgtgaca agaactgatg tcaatgagat 420
 ttacgccata ggaagcataa aagaagacta ttt 453

<210> 282
 <211> 525
 <212> DNA
 <213> Candida albicans

<400> 282
 ccaagaactt accattattg aacaaccact tcagaaagca ctggcaagaa agagtcagag 60
 ttacttttga ccaagctggg aaaaaagctt caagaagaca atctagattg agaaaagctg 120
 ccaagattgc cccaagacca atcgatgctt taagaccagt cgtcagagct ccaactgtca 180
 aatacaacag aaaagtcaga gccggtagag gtttactttt ggccgaattg aaagccgttg 240
 gtattgctcc aaaatacgcc agaaccattg gtatctcagt tgaccacaga agacaaaaca 300
 aatctcaaga aacttttgat gctaacgtcg ccagattaca agaatacaaa tctaaattag 360

ttatctttga caaaaagacc aaggcttctg aagttgcttc tttcgaacaa gttgatgtct 420
ctgccacctt cccagttgaa caaccagctc cagaatctgg tttgagagct gttgaagttc 480
cagaacaaac tgcttacaga accttgagat tggctagaaa cgaaa 525

<210> 283
<211> 400
<212> DNA
<213> Candida albicans

<400> 283
ttaaaggatt caaaaagggt gtccttaggg cccacagac aatgcgtcag aaattcaaca 60
tgggagaaat cacccaagat gctgtttatac tcgatgctga aagaagattc aaagaaatcg 120
aaacggaac aaaaaagttg agtgaagaat ccaagaaata tttcaatgct gtcaatggga 180
tgttagatga acaaatlgat tttgccaaag ccgtggctga gatttataaa ccaatcagtg 240
gtagattatac ggacccagat gctacggtac cagaagataa cccacaaggt attgaagcat 300
cggaactgta ccaagcagtg gttaaagatc tcaaagatac cttaaaaccc gatttggaat 360
tgattgaaaa aagaattggt gaaccagcac aagaattatt 400

<210> 284
<211> 522
<212> DNA
<213> Candida albicans

<400> 284
catggcacca gaaagaacca ccaattataa caccatcgt ttaatcaacc aattaattga 60
tatgaatcaa tatgagtcaa ttgaaatcaa tgggacaaca gtgacaaaat caaactgtaa 120
atatttacct acattggctg gggatatattg gtcattggga gtattgttca ttaatatcac 180
ttgttcaaga aacccatggc ccattgcac atttgataat aatcaaaaata atgaagtgtt 240
taagaattat atgttgaata ataacaaggc tgttttgagc aaaatcttac ccatttcctc 300
acaatttaat cgcttattag atagaatattt caaattgaat cctaatagata gaatagattt 360
accaacttta tacaaagaag ttattcgttg tgatttcttc aaagatgac attactacta 420
tgcccaacat caacatcac acaatcaca tcaaatcaat aatgcttaca atcactatca 480
gaaacaacct aatcaagcaa gacctactgc aaaccaacaa tt 522

<210> 285
<211> 500

<212> DNA

<213> *Candida albicans*

<400> 285

| | |
|--|-----|
| tataatgccc cgaaaataaa gtttacgat actgaaggac aagaagaaca tttttatttc | 60 |
| aatcggagta acaattcaac caatgattta accagtcattg actcttcattc aactcaacta | 120 |
| caagatgccg attccagaag acaagcccca ccaccaccac cacataatcc attttctgac | 180 |
| aattcccatg aaaatagtag tgaatcatta tatcaatcag aaacaagatt tcatcaacca | 240 |
| ctacttcata atgatagtaa taatagcaat agcagtatag gcaataatag acaacgtatt | 300 |
| ccatcacacaac aacatgatac actgtcatta tattcagcat caccaatattc aacatcacct | 360 |
| ttagtttcta attttcaatc atatctggac aaccaagacg aaatgactcg aggttaagtat | 420 |
| aaccagaata caaatcggtc aagttcaaat tatattcaac acagtccaac atcagcaggg | 480 |
| tacgatagat atccgcttaa | 500 |

<210> 286

<211> 279

<212> DNA

<213> *Candida albicans*

<400> 286

| | |
|--|-----|
| tggaacctgt ttgtacttga cgtcattgtc gaaaaaacac ccagagaaat tgtgtaaaga | 60 |
| gaaatacgtc cacggcggtg acgtgttgat cgacccaact gccaaagatcc acccatctgc | 120 |
| cttaatcggg ccaaactgca ccacgggtcc aaacgttggt gtcggtgaag gtgctagaat | 180 |
| ccgaagatca gtgttggtgg ccaactccca agtcaaagac cagcctggg tcaaactctac | 240 |
| cattgttggt tggaactcca gaattggaaa gtgggctag | 279 |

<210> 287

<211> 597

<212> DNA

<213> *Candida albicans*

<400> 287

| | |
|--|-----|
| gatttcctag ccggaatgca cgacaatcct gagacggaag tcgatcgtcg atgcccattg | 60 |
| tgcgtggtga aaaattttct tagaaaattt gttctttcct tcaactgctt ttaagaaaga | 120 |
| gaggttcaag tggtttaagt acgacggtca caaagattgc ggcttatgag gcccgaaactg | 180 |
| agttgaaata caaatcaag atataattat ataccttact tgtccatatt gttttataat | 240 |
| acattcttca gatattttaa tttctgtgta tcaacctata aaacagagat acattcagtg | 300 |

catttagtat actgagtga ctggtacctg tgacattcaa gataactgtt tcgcgcacgc 360
 tggcagacga acagattaga agcttggtaa agttctgctt tgctcaatag gtttcagatt 420
 cagaaagatt gttaaaactt agatcatctt cgttcacac aaaccaagaa ctttacggaa 480
 tgtacgaata tcactttcat tagtagataa ttcgttactt aatccagtga ttaatcttga 540
 ggttcgaaag atggttaata gaaatttatt tgacaattac gactaagggt acataat 597

<210> 288
 <211> 350
 <212> DNA
 <213> Candida albicans

<400> 288
 aagacgactg agcgtgtccc ttttgataa actttataat tttcaatgaa tcttttaccc 60
 cattggtttc aacaccgcca ctaacatcgt agcccaaat gttgtcaa atgtaggcaa 120
 tctcaggggt tagccacca gcaagtatag cttttgtagg taactttctca ataaacgtcc 180
 aatcaagtaa cttcccttca ccccaactt ccgaatcaag caacggcaaa ctcacacatt 240
 gcgttaacag caagctctgc ttttccaaaa ggtctagctc gtcaggaaca acatacctgg 300
 gaattaaccc aaattctgta cccaaaaact cttagcttata ttccagtcca 350

<210> 289
 <211> 330
 <212> DNA
 <213> Candida albicans

<400> 289
 acatgtcaag aggattgttc atgtaagaat aatgaagccc ccacaacaaa gacaactgcc 60
 accacaacta atgttggtga tggccctggc cctggcccta tccctggcaa taatgatgat 120
 gatgatgatg acatttggtc agatgatgat acgaaactaa tacctgaaaa tgatataata 180
 cgatcacatt ataaaaaagg gtatgttgat gggataactc aagctaaaga atcttcatta 240
 caacaaggat ttgatgatgg atatcctgaa ggtgcaaaat tagggattaa agttggtgaa 300
 attttagcaa atttaataca tcaatgtaaa 330

<210> 290
 <211> 524
 <212> DNA
 <213> Candida albicans

<400> 290
 gccgaagata ctaaaccaaa gactgaagaa tcattcttcta ttccaaaacc accaacttct 60

aatgtattct ccatgttttg tgccaaaaa gagaaaaaac cagaacaaga agattcagac 120
 aacaagaaag aatccgataa aaaggaagaa aaagatacta gcaaatcaac tggatgatgat 180
 aatgaagtag ctgaagaaga agaagctgat gtcgaattta ctccagttgt tcaattggat 240
 aaaaaagttg acgttaaaac caatgaagaa gatgaagaag tcttgataa agttagagcc 300
 aaattattta gattccatgg tgattcaaaa gaatggaaag aaagaggtac tggatgatggt 360
 aaatttttaa aacataaaac tactggtaaa gttagaattt taatgagaag agataaaact 420
 ttgaaaattt gtgctaatac tttgatttct gctgattatg aattgaaacc aaatattggt 480
 tctgatagat cttgggttta tactgttact gctgatgttt ctga 524

<210> 291
 <211> 513
 <212> DNA
 <213> *Candida albicans*

<400> 291
 tctgatgttg ctgtttgttc ttcaagaact ttcggtcaaa gagctgtttt gaaatttgct 60
 gctcacactg gtgctactgc cattgtctgg agattcactc caggtaactt taccaattat 120
 atcactcggt cattcaaaga accaagatta gttgttggtta ctgacccaag aaccgatgct 180
 caagccatca aagaatcatc ttatgttaac attccagtta ttgccttgac tgacatggac 240
 tctccatctg aatacgttga tgttgccatt ccatgtaaca acaaaggtaa aactctatt 300
 ggtttaatct ggtggttgct tgctagagaa gtcttgagat taagaggtat tatcccagac 360
 agaactaccg aatggctcagt tatgccagat ttgtacttct acagagaccc agaagaaatt 420
 gaacaaaatg ccgtcgaaga agctaaaact gaagaagttg aagaagctcc agttgctgaa 480
 gctgaaaccg aatggactgg tgaaactgaa gat 513

<210> 292
 <211> 613
 <212> DNA
 <213> *Candida albicans*

<400> 292
 tcgaccatac catccaatac ttgaatcatt ggaatttcaa accaatcaac atttaattca 60
 agaattattct ttagatattg tcaatacttt atctcaattg gaatcactta cattagttaa 120
 tcttgccatg attgatattac aaccagaaat tcaatggttt atgcgtccat ttttattaga 180
 ttttttaatt gaattgcatt cttcatttaa attacaacca acaacattat ttttatgtct 240

taatattatt gatagatatt gtgctaaaag aattgttttc aaacgtcatt atcaattagt 300
 tggttgtaca gcattatgga ttgctagtaa atatgaagat aaaaaactgc gtgtaccac 360
 attaaaagaa ttaacaataa tgtgtcgtaa tgcttatgat gaagaaatgt ttgttcaa 420
 ggaaatgcat attttaagta ctttagattg gtcaattggc catccaactt tagaagattg 480
 tctacaatta gccattgac tgaataatct atctaacaac accactaatg atattgaaaa 540
 caaaagtgtg cgtcctaata ggaaatcaag tatatcatca gctgtaactg ctgttgctag 600
 gtttctttgt gaa 613

<210> 293
 <211> 251
 <212> DNA
 <213> Candida albicans

<400> 293
 agaaatttgg cctgatgtta attatttacc agattttaaa tcaagtttcc ctcaatggaa 60
 aaagaaacct ttgagtgaag cagttccaag tttggatgct aatggaattg atcttttgga 120
 tcaaatgttg gtgtatgac caagtagaag aataagtgtc aaacgagctt taattcatcc 180
 ttattttaat gataatgatg atcgtgatca taacaattat aatgaagata atattgggat 240
 tgacaaacac c 251

<210> 294
 <211> 564
 <212> DNA
 <213> Candida albicans

<400> 294
 aacagcaacc agaaatcaag ttaggtatga gaccattgtt gttggatttc ttaatggaag 60
 ttatcactat tctcaacttg tctagatcta cattcccttt gactgtcaat ttgattgac 120
 gttattgttc aaccagaatt gtcaagaaac aacattacca gttgttgga ttgactagtc 180
 tttggatcag ttgtaagaac ttgattcaa agttcaaagt tcctacattg aatgatttga 240
 gaaaaatttg tgttgacagt tattacaaag aattgtttgt ggaaatggag aaacatattt 300
 taaaatcatt agaatgggtc gtcaatgtc cgacatttga tgcctttatt gatttgtatt 360
 caaacttgtt gatttctaac agcagtaact ttgaggtgac aaacattatc aaaaaatcat 420
 ctcataaaat aaaattgttt tccaattata ttggtgaatt gttccagttt tatccaaaca 480
 tttattacga ttacacatcg tcacaaattg ctttgattgc tattttaatc acggtcttga 540

cggtgaagat tcctgttgat ttaa

564

<210> 295
 <211> 580
 <212> DNA
 <213> Candida albicans

<400> 295
 gctaccactt taaccgacac cggtgtatcc tcaggattga ataataccac ttctggtggc 60
 ggcagtgata gtgcaacctc cacacacaac aacaatgagg catcgaccaa accaagtaat 120
 ggcagtgaaa aatcgtcacc ggagtacact acaactgccc gcggtagaga tgagtttgga 180
 ttcttaaatg aagccacacc aagtcaatac aaagccaatt cagattatga agacgatttc 240
 ccattggatt atatcaatca gaccactcaa aattctgaag attatattac tttggatgca 300
 aattatcagg caggaagtta tgcaaataatg atcgaagaca attacgattc atttttggat 360
 gcaacactat ttatacctcc aagtcttggc gtacctacag gtacagctgc gactgcaaca 420
 acatcaaacc aagttgcctt caacgacgaa tacttgattg aacaagccca accaataagg 480
 actccactac cccaatatc atcatcaaca atatccgat tattacaacc aaaatcagct 540
 gctaaattct ttctactaca gagtgctaata ggtggagaag 580

<210> 296
 <211> 604
 <212> DNA
 <213> Candida albicans

<400> 296
 tttcatcacc acctcaagtc tctgtaacat catctgaagg agtttcacat gtcaatacac 60
 gtcaatattt gggatgatgtt tcaaatcaat acataacaaa tgctaaacca acaaataaaa 120
 gaaaaccatt ggggtggagac aatgcccctc tacaaaaaca acagcataga ccatctagac 180
 caatacccat tgccagtgat aacaacaata atggtagtac cagtagcagt agcaacagta 240
 gcaacaacaa taacaacgac gcaaatagac tagcatcttt ggcagttcca tctcgattac 300
 cccaaaaacg acaagctact gaatcgctga caaatttagt agagaaatta agagtaccac 360
 aaccagaagt aggggaaaga agtcagtcac accataagaa atcacgttta attgattatg 420
 aatggcagga tttggatgaa gaagataatg acgaccaatt aatggtagt gaatatgtta 480
 acgaaatatt ttcgtactat tacgaattag aaacacgaat gttacctgat ccgcaatatc 540
 ttttcaaaca aacattgtta aaaccaagaa tgagatcgat attggttgat tggcttggtg 600

aaat

604

<210> 297
 <211> 735
 <212> DNA
 <213> *Candida albicans*

<400> 297
 ccagcaaaca attcctaatac aattgtcaca gccacaacct cagcattaca atggatctaa 60
 tcgtaattac acaagtgtct ctagtgggtgc ccccatacct tccaattcta ccagtggacc 120
 ttcacaacag ccaccactac cagggtcaaca agcagtacct atcccaccac atgtatcgac 180
 aatgcaacaa ccaactcctg ttcaggatac gttgaacgcc tcgagcactt ccactgtggg 240
 gcaattccaa ccaccaggaa tcagaccacg agtaacaact accatgtggg aagatgaaaa 300
 aactttgtgc tatcaagttg atgccataa tgtgtcgggt gtcagaagag cagataataa 360
 tatgatcaac ggaaccaaata tgctcaatgt ggcccaaatg acacgtggta gaagagatgg 420
 gattttgaaa tcagaaaagg tgagacacgt tgtgaaaatc ggatcaatgc atttgaaagg 480
 agtctggatt ccatttgaaa gagcattggc catgggtcaa cgtgaacaaa ttgtggatat 540
 gttgtatcct ttgtttgtca gagatattaa acgagtgatt caaacggag taactcctaa 600
 tgcagctgct gcaacggccg ccgccgctgc cactgccact tctgcttcgg ctctccacc 660
 tccacctcca cccgttctg ctgtactac tactgtgct actgctattt ccaaaagtgc 720
 tagcgtaat gggaa 735

<210> 298
 <211> 563
 <212> DNA
 <213> *Candida albicans*

<400> 298
 gctcgtttga ttagatttgg gatctttgcc cttgttttaa taggatgtgg ctatatcctt 60
 acaagaggct catcattcca acctccaaat tatcaacaaa cacaatcacc cgccgctcat 120
 gaaaaacaga ccggtaatgt tgctgctgga ggtggtgctg gttcaggttc cgcaggagct 180
 caagttccat taggcacaaa tagaggcca ataccaaaag caattatggg agctggtgaa 240
 ggtggtagt atgctccggt tcctcaacaa gatattcctg atagttatac cctcaatgac 300
 aaaattaagg ctacatttgt cactttggcc cgtaactctg atttatattc ttagctgaa 360
 tcaattagac acgttgaaga tcgtttcaat aagaaattcc attatgattg ggttttcctc 420

| | |
|---|-----|
| aatgatgaag aattcaatga tgaatttaaa gaaactgttg gtagtttagt tagtggtaac | 480 |
| actaaatttg gtttgattcc aaaggaacat tggtcatatc ctccatggat tgatcaagaa | 540 |
| aaagctgctt tagtccgtga aca | 563 |

<210> 299
 <211> 554
 <212> DNA
 <213> Candida albicans

| | |
|--|-----|
| <400> 299 | |
| cccaactaat tcagcatcac ttaaacagaa acaacgtcaa cagctaggaa ttaaattccga | 60 |
| gattggtgct tcaacatcag acgtatatga tccccaagtt gctagttatt tgagtgttg | 120 |
| tgattcacct agccaatttg ccaacactgc cttcatcat agtaatagtg ttggttattc | 180 |
| tgctagtgc gctgcagctg ctgcggaatt acaacaccgt gcagaattac aaagaaggca | 240 |
| acaacaattg caacaacaag aattacaaca tcaacaggaa cagttacaac aatatcgaca | 300 |
| ggctcaagca caggctcaag cccaggcgca agctcaaaga gaacaccaac agttacagca | 360 |
| tgcttatcaa cagcaacaac agctacacca attgggtcaa ctttctcaac agttggcaca | 420 |
| accacatttg tcacaacatg agcatgtcag agatgcgctc actacggatg aatttgatac | 480 |
| taatgaagat cttcgttcac gatacattga gaatgagatt gtaaagacat ttaacagtaa | 540 |
| agccgaattg gtac | 554 |

<210> 300
 <211> 503
 <212> DNA
 <213> Candida albicans

| | |
|--|-----|
| <400> 300 | |
| aacagcaagc tgctcagttg cagcaacaaa tgcaacagca attgcaagcc agtgggttgc | 60 |
| caacaacacc aaactattct gaattgttag gtcaattagg ccagttgtct caacaacaat | 120 |
| cacagcaaca gcagcttcat catatacctc aacaacgtca acgaaccag agtcaacaac | 180 |
| tgcaacagca acctcaacaa actgcacatg gattggatca accagatgct gcagttattg | 240 |
| ctgcaattga agctagtgc gacgcagctg ttgcgtctca aggatcacct aatgtcactg | 300 |
| cagctgctgt agccgatta caacacacac agggtaatga gcacgatgct caacaacaac | 360 |
| aagatcgttg tggttaataac ggtggtgcta ttgattcaaa tgtcgatcca agtcttgacc | 420 |
| caaacgttga ccctaattgt caagctcatg atcattctca tggattaaga aattcgtatg | 480 |

ggaaaagaag tgggtttttg taa

503

<210> 301
 <211> 724
 <212> DNA
 <213> Candida albicans

<400> 301
 gtcctttcaa gtgtttgtgg agcaactgta acattatattt cgagactcca gaaattttgt 60
 acgatcattt gtgtgacgac catgttggtg gaaagtcttc gaacaatttg tcattgactt 120
 gtctttggga aaattgtggc acaactacag ttaagagaga tcacattact tctcacttga 180
 gagtccatgt cccattgaag cttttccatt gtgacttggtg tcccaaactcg ttcaagagac 240
 ctcaagattt gaagaaacat tccaagactc acgctgaaga ccatccaaag aagttaaaaa 300
 aggcacaaaag agagttgatg aaacaacaac aaaaagaggc caagcaacaa cagaaattgg 360
 ccaacaagcg agcaaaactcg atgaatgcaa ctaccgcac cgaattgcaa ttgaactact 420
 attccggtaa ccctgctgat ggattgaact acgacgacac ctccagaaaa agaagatacg 480
 aaaacaattc tcaacacaac atgtatgtgg ttaatagtat tttgaacgat ttcaacttcc 540
 aacaaatggc acaagctcca cagcaaccag gcgttggttg aaccgcagg ttctggetga 600
 gttcacccac caagaggatg aaagccggca ctgagtataa cattgatgtg tttacaagt 660
 tgaatcattt ggacgaccac ttgcaccacc accaccctca acagcaacac ccacaacaac 720
 aata 724

<210> 302
 <211> 543
 <212> DNA
 <213> Candida albicans

<400> 302
 ataaccaca taaggctctg ttaccaggag aagaaatctc aggacaagtt gtattaattt 60
 cgaaaaagaa tttggcaa atagtcataa cgttgtcgtt ggtggggttt attaaaataa 120
 atgcatcgtc acatctgaag ttgaggcctt tgaagcatac gttatttgat tatactatta 180
 aaatctatgg taaagatgaa gaagaacaaa cagactcagc agagttagt aatggacttt 240
 tgaaaggcga acatgtgttt ccgtttattg taaagttgcc caataaaaga gtatatacgt 300
 cgattgattt tgggaaaggt tccatcaact acattttgaa agcagctata ggaaactcgt 360
 cgtcctatgt gatacctgcc tcgcccga atgccagtag tagcagttta acgaaaaaga 420

aaatactaca gaatcctagt cacacatcag aaaaagtcac aagtctagta aatccaatag 480
 atgtttcgtt attgcctcga ccgaaaccaa agagattgat tctcaaagat ccacgaacta 540
 gct 543

<210> 303
 <211> 315
 <212> DNA
 <213> Candida albicans

<400> 303
 tgactacgat gactactgaa gaaatattgg cttcttatcc acaaatacacc gctccaaccg 60
 atcaaacagg ttacacatca aatttaacac ctgaacaaaa aaccacttta gatataattca 120
 gacaacaatt aactgaattg gggtataaag acagattaga tgatgcatca cttttaagat 180
 ttcttagagc aagaaaattt gatattcaaa aagctattga tatgtttgta gcttgtgaaa 240
 aatggagaga agattttggt gttaatacca ttttaaaaga tttccattat gaagaaaaac 300
 ccattgttgc taaaa 315

<210> 304
 <211> 230
 <212> DNA
 <213> Candida albicans

<400> 304
 attggtttca aacagttact cagcacgcca atgaggatgc acagatattt ttagtaggta 60
 acaagtgtga tgatgaagta aacagacaag tttctaaaga gcaagggtcaa gaattagctg 120
 ctaaattaaa tgttccattt ttggaagcca gtgccaaaag caatgaaaac gttgactcta 180
 ttttttacga attggctagt attatccaag agaagcatgt tgaagagaat 230

<210> 305
 <211> 575
 <212> DNA
 <213> Candida albicans

<400> 305
 aaagagctaa ccacgtcaag gaaatcccac cattcttgca agatttagac attgccaaag 60
 ccaaccccga gttcaagaaa cagcacctcg aatactatgt gttgtacaac ccacggttct 120
 ccaaagactt ggatattgac atgggtccact ccttagacca ctggtcagtt gtttgcgtcg 180
 tgagattttc cagagacggc aagttcatcg ccaccggttg caacaaaacc acccaagtgt 240

tcaatgtcac caccggagag ttggtcgcca aattgattga cgagtcctcc aacgaaaaca 300
aagacgacaa caccaccgcc tcaggcgact tgtacatcag atctgtgtgt ttctcccctg 360
acggaaaact cttggcgaca ggtgcagaag acaagttgat tagaatctgg gatttgagca 420
caaagagaat tatcaaaatc ttgaggggcc acgaacaaga catttactcg ttagactttt 480
tccctgatgg cgatagggtt gtttcaggct ccggcgatag gtcagtcaga atctgggact 540
tgagaacctc ccagtgttcc ttgactttgt cgatc 575

<210> 306
<211> 286
<212> DNA
<213> Candida albicans

<400> 306
aggtggtgtc atgaaattat tagttggtaa taaggctgat ttgtctgata aaaaaatcgt 60
cgaatatact gctgctaaag aatttgctga tgccttggaac attccatttt tagaaacctc 120
cgctttatca tcgaccaatg ttgaacaagc tttttacact atggcaagac aaatcaaagc 180
ccaaatgaca aacaatgcc aatgccgaaa tgctgccaat gccaaaggga aatctaattg 240
gaatttgaga ggtgaattct tgactttctaa ccaatcgaat tcctgt 286

<210> 307
<211> 558
<212> DNA
<213> Candida albicans

<400> 307
ttgccaatc agcattacaa tttgcaacaa agacaacagg cacaaggaca acaactcaaa 60
ctgcaactaa acgagcaaaa tgccatgatg tctgcctcga ctcaacaata tcctgtccag 120
gattttacaa atccttacc caatgcacag aatcccgag aacaacagca acagcaacaa 180
cctcttcgaa ccagtcaca acaatgggac ggctaccaat ctcaaccttt gtattctgct 240
gctggttaata ctataccatc ctcaatccag cagcaaatac caccacagaa tttgtctcca 300
tcagagcagc aacaagtcaa gcaacaacag ccactgccgc cagaacaagg aacaaagaaa 360
aaacctggta gaaaaccaa attaagaaaa ttatcggaac tgagttctga aacaccacaa 420
gttccaaaaa cagcatccag ttcttcgagc tcaccaactg cagtcaattc tggtaaacca 480
attacaaaaa gatcgcgat gggatgtctt acatgccgct aaagaaagaa acgttgttgt 540
gaaacaagac caaggtgt 558

<210> 308
 <211> 450
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 308
 atatcgaagt ggtctattta gaggacttag ctgctgaagc gttgattaat gaagaggtcc 60
 gccgacaatt tattgaccaa ttcttagaag aagccaatat tcgcagcgaa tcagcaaaag 120
 aaaaagttag agagttaatg ttagaaattg acgacaacga agaacttatt caaaaagcga 180
 ttgctggcat tcaaaaacaa gaattaccta aatatgagca agaattttta acagatatgg 240
 ttgaagcgga ttatccattc attattgatc caatgcctaa cttatacttc acgcgtgata 300
 actttgcgac aatggggcac gggatttctt taaatcatat gtattcagta actcgacaac 360
 gggaaaccat ttttgggcaa tacatttttg attatcatcc tcgttttgct ggaaaagagg 420
 ttcctagagt ctatgatcgt tcagaatcaa 450

<210> 309
 <211> 280
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 309
 aattaaacaa agcaggaatc aagaaacaag tggctactgt tttacacag gtggctcgtag 60
 atccagcaga tgaggcattc aaaaatccaa caaaaccgat cgggtccattt ttaacagaag 120
 ctgaagccaa agaagcaatg caagcaggtg ctatttttaa agaagatgca ggacgtggct 180
 ggcgcaaagt cgttccaagt cctaagccaa ttgacatcca cgaggetgag actattaata 240
 ccttaataaa aatgatata attaccattt catgtggtgg 280

<210> 310
 <211> 600
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 310
 agttgcacaa gtagcgatgg cgatggcttt taatcctcaa aaagattatt ttttaccgta 60
 ttatcgtgat atgaccgcgt gcttggtttg gggcatgacc tccaaagata ttttaatggg 120
 ttcttttga aaagaagcgg atccttcttc ccatggtcgt caaatgccga atcattatgg 180
 ttcaaaagag cataatattg tttccttctc ttcaacagta agtacacaaa tgccattagc 240
 aacaggtggt gggtatgcag cgcaacttca aaaagctgat tttgttgcgt tgaccaccac 300

| | |
|--|-----|
| tggggaaggc tctgccaatc aaggagaagt ccaagaagct attaactttg caggcgtaaa | 360 |
| aaaattacca gtcatttttg ttgttgaaaa taatgaatat gcgattttctg tcccaattga | 420 |
| agaacagtat gccataaac gaatggccga tcgcgcgaaa gcttatggct ttgaagggtg | 480 |
| gaccgttgat ggtagtgatt ttgctgaagt ctatctagca tttaaagaag cagtaaaagc | 540 |
| ggctcgcggg aaaaaaggac caaaattgat tgaattaatg gtttctcgct tgactttctca | 600 |

<210> 311
 <211> 528
 <212> DNA
 <213> *Enterococcus faecalis*

| | |
|--|-----|
| <400> 311 | |
| cgcagacaag aaagacaaca caacgaactc ttctagcgta gcattcttcag aaacgaaaaa | 60 |
| atcaactgaa tcattcagcac cagcgaaaaa agttgccggt ggcgatttaa aagatggtac | 120 |
| gtataaatta gaagaaaaaa atgaaaaaaa tgggttaccgt gcagtctttg aaatgactgt | 180 |
| aaaagacggc aaaatcactg aatctaata tgacaacatc aatgctgacg gcaaactctaa | 240 |
| aacagaagac actaagtatg aagaaagcat gaaagcaaaa tctgggtgtg gaccaaaga | 300 |
| atacatcaaa caattaaacg attcttttgt taaagcaca agcgcaagcg gtgtggaagt | 360 |
| agtaactggt gcgactcatt catctgaatc attccaaaac tacgcacaac aattaatcca | 420 |
| agcagcaca gctggtaaca cagacacaat cgaaatcgac aatggggcaa cattgaaaga | 480 |
| tggtacgtac tcattgaaag aaaaaaatga ctcaaacggc taccacac | 528 |

<210> 312
 <211> 451
 <212> DNA
 <213> *Enterococcus faecalis*

| | |
|---|-----|
| <400> 312 | |
| ttttcacttt taggagctat ttttatttta gctagtgtg gcataaggaaa agatgctgtc | 60 |
| acagatacta agtacaaagt tagtttgacg caagctgctg aaatctatga aaaagaagct | 120 |
| ggcaacagca aaccattagt aaatgtccaa tttgatacag aaccagcaag tgactacagc | 180 |
| tatatcttta ctaacgatac agaaacactt tacgtgaatc ctgaaacagg aaaagtcacc | 240 |
| aaaaatactg aagcaaatca acttggcgaa aacgagacag ctttttcagc tgctgaagtc | 300 |
| aaagaattag gcgctgttaa cgacgtttta gccaaagcaa aaaaagaagt tggaggactt | 360 |
| tctccacgta ttttgacttg gaagttaacc aaaaataaca ataaacttgt ttatacagta | 420 |

gatgttaaaa cgactacggc agatgaaaaa g 451

<210> 313
<211> 274
<212> DNA
<213> Enterococcus faecalis

<400> 313
caaaaccaac agaagaagaa ttaaaacaaa ccttgacgga tcttcaatat gccgtcacac 60
aagaaaacgc aacagaacgc cctttttcag gagaatatga tgacttttac caagacggaa 120
tctatgtaga cattgttagt ggcgagccgt tgttttagctc cctggacaaa tacgatgctg 180
gttggtggctg gccatccttt accaaaccaa ttgaaaaacg tggcgtcaaa gaaaaagctg 240
attttagtca cggcatgcac cgagtagaag ttcg 274

<210> 314
<211> 564
<212> DNA
<213> Enterococcus faecalis

<400> 314
ggcttagttg tcagttgtgg ggcctttttt gcccaacctt ctgtgactca cgcagaagaa 60
gatattaccg cgattgctaa aaaaatgggg acgactttga aagcggatgg cattcccaa 120
gcagccatcg ttgttgatgc tgattctgga gaaattctct ggtcgcagca accagattta 180
gcgtggaatc ctgccagtat tgccaaagtg atgaccatgt acttggcctt tgaagcaatg 240
gagcaaggaa aatttacaat ggatacgact gtgactgcta cgaaaaaga tgtcgatatt 300
tctaaaatat atgccattag taataacaaa attacgttag gtgttgctta tccagtcgt 360
gaactgttaa aaatgattgc tgtcccctct tctaattgtg cgactctcat gttggcaaac 420
ttaatttcag ggaaccagcc tactgacttt gttcatthaa tgaatcaaaa agcggctgaa 480
ctagggatga caaatactac ctattacaac tgcagtggag cgcaagcaag tgcctttaac 540
ggcctgtatc aaatgcaagg aatt 564

<210> 315
<211> 478
<212> DNA
<213> Enterococcus faecalis

<400> 315
gtttgattgt tgcgagggtca aagaataatg ttataggcaa gaatggtaat ataccatgga 60

aaataaaggg agaacaaaag caatttagag agttaacaac gggtaatgtg gttattatgg 120
 ggcgaaagtc ttatgaagaa atcggtcacg cggtgcctaa tagaatgaat attggtgttt 180
 ccaccacaac agagtataca ggagataatt tagtttcagt taaatcatta gaagatgcat 240
 tattattggc taaaggacga gatgtataca tatctggtgg atatggacta ttttaaggaag 300
 ctttgcaaat agtagataaa atgtatatca cagaagtaga tttaaatatt gaagatggag 360
 atacattctt tccagaattt gatatcaatg attttgaagt tttgataggg gaaacacttg 420
 gtgaggaagt gaaatatacg agaacatttt atgtaaggaa aaatgaattg agtagatt 478

<210> 316
 <211> 380
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 316
 ttttactaaa ccattaggtg taaaattacc cccatttttt gatattgcac attttgacgc 60
 aatggctgaa attttaaata aattcccttt agtttacgtg aatagtatta atagcatcgg 120
 taatggttta tatattgaca gtgacaagga agaagtggtc attaaaccaa aaggaggctt 180
 cgggtggactg ggcggcgaat atgtcaaacc aacagcgtta gccaatgttc gtgcgtttgc 240
 gcaacgtttg aaaccagaaa tcaaaattat tggaacgggc ggtattacat gtggaaaaga 300
 tgtttttgag catcttttat gtggtgcgac attagtacaa gttggcacac aattgcatca 360
 agaaggtcca caagtttttg 380

<210> 317
 <211> 537
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 317
 catgtattgg ttgttagata gggagtatga aaacttatat aatagtactt ataaagaaag 60
 tgcgcattta agagtcaaaa ttgcagacga tttgtcaaat ttaccattat cctatttttc 120
 aaaacataat ttatcagatt tatctcaaac tatcatgtct gacgttgaag gtattgagca 180
 tgcgatgagt catgcaatac ctaaaccggg tggtaggtct ctgtttttcc cttttatttc 240
 agtgatgctt ttggttggtg atgtcaaaat gggattagct gttattttgc caacgttatt 300
 tagttttgtc ttaatcttgt tatcaaagaa atcccaaagc aaagccaata ctaaataatta 360
 cgatactttg agagaaaact cggaagaatt tcaagaaact attgaattgc agcaagagat 420

taatagcttt aatctatcta aaaaagttca agacagactt ttcaaaaaaa tggaagagag 480
 tgaaaggatt catttaaagg tagaattaag tactttttca gtcatggcct taccctc 537

<210> 318
 <211> 606
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 318
 gatcaggaag atcaatcagg aaaaacacaa tggacaaagt attatctaac cgtttatttt 60
 tctggcttat ttaattttct gatgattctg attttatcag ttttatttgg gacgttaagc 120
 gaaaccttta ttgtatacgt cgtactgatt tttttacggc ctgtcgcagg tggctggcat 180
 gcaaaaacta aatggctctg tcgtctagaa agcattgtta tctatgtcgc cataccattt 240
 gtattgaaaa attcttctgt gagcttaccg tttatttata aaattctatt gatttgcctc 300
 ttagtcgtat tattttattg gtatgcgcca caaggaacag caattgaacc tgttcagcca 360
 tctgatttaa acgtgctcaa aaagcaaagc cttataaggg tgtgtttact tattttatgt 420
 agtctgtttg tcaaagaaaa gattgcttca gtaatactct acggtctcgt catccaaggt 480
 ctgatgatac tccctgtaac aaaaaattta attgaaggaa gtgtttttat gaaatttggt 540
 aaaaaataa ttaaaaatgt tattgaaaaa agagttgcaa aagtcagtga tgggtgtggga 600
 actaag 606

<210> 319
 <211> 507
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 319
 gttgggctac tcttggttga tttatgcgct gacagtcggt gtttttacag gatttttact 60
 cattcacaaa aagaggttct caatttttaa agcgatattt ttatccgttt ttacattgct 120
 tatggtttcg tttatcaatt acacggagca aacgatttta agtgtttttt ttcaacagat 180
 ttatcaaaat aaattattat ggattgcctc aaatgttctt ctgttgctta taaatatctg 240
 gattgcttta aaaattccca atagtgtttt tttaagatta aatcgtgtgt tagaaaatag 300
 ccgaattttt tttggttggt tacttttatt gttgattctg ttgttacttt ttgtgttttt 360
 gatttcgcca gagatttcac ctgactttat gcgaggattt gtcacggtaa atagttctaa 420
 attggagtta ttaataagtg taggtttatt tttaattctg attggcttag tcattgaagc 480

ttatattggaa gaacaacgta tcaacac 507

<210> 320
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 320
ttacgttaga agaagcatac caagagtcaa aacggatgca agaattggtc aatttttcac 60
caaataatca attgctctat aaaacagctg ttcagctaga aggattgcct cgccatgttt 120
ctacgcacgc agcagggtgtg gtaattagtgt atgaaaatct tttgaatttg gttccgttac 180
aaccaggatc gaatgaaatt ttattgaccc aattttactat gaatgatgtt gaaaaaattg 240
gtctttctgaa aatggatttc ttgggcttaa gaaatttata catcattgat gataccctca 300
cagctgttaa acgcgtctat aatcgaacca ttcgtttaaa tcagattcca ttagatgacg 360
aaacaacgct ggctttatctt agaaaagggg aaacaagtgg cgttttccag tttgaatctg 420
ctggaattcg gaatgtatta agaaaattag ggccaactag cattgaagat attgctgctg 480
tcaatgccct gtatcgtcct 500

<210> 321
<211> 407
<212> DNA
<213> Enterococcus faecalis

<400> 321
tttatgaagg cccaaagaat gatcttctgc taccttcaat tcaggctttt ttatcttaag 60
tgcctcaaga aataacgaat cggttttctt tttcattaaa aagacttttg agccttcctt 120
aaattctgag gaaaaaattt cgatgctttt ttcattgtag gttacttttt ctatctgaga 180
aagcggaggt gcttttttgc gaaaccacaa aacatctctg acaattaaag atgtttctgt 240
catattaaaa gaccgcgcaa ttcctagata agcaaacaca aaaaatggaa ccatcaccag 300
attactaatc aagtaaggac cattatcttc caatgctaaa attaaactaa taaataatat 360
acaaaatgtg caagaccagt aaataattgt tgatgctaatt tctggct 407

<210> 322
<211> 607
<212> DNA
<213> Enterococcus faecalis

<400> 322
tttacctcac cgaccaatcg cggcaacaat tgcattgtgcc tttaggcatt gttagtaatc 60

acgaagccga atttaaagtg ctgattgaag ctttaaaaca agcgattgcc aatgaagaca 120
atcaacaaac cgttcttctc cactcagata gtaaaattgt tgtccaaaca attgaaaaaa 180
actatgctaa aaatgaaaag taccagcctt atttagcaga atatcaacaa ctagaaaaga 240
attttccttt gctcttaatc aaatggctac ctgaaagtca aaacaaagcg gccgatatgc 300
ttgcacggca agcattacaa aaattttatc ccaataaaaa gtagcactgt ttacttaatg 360
cttttccttt attaatttga taattaaaca cgtggagcaa aaattccaag tgatttttgc 420
tccacgttta aaaacagata aacggttctg tctcgacttc ttcttatagc cacttattct 480
tttgcgtta tttccgcaa ttgccattg gttagcgaaa ggattgcttc aggcgctaata 540
tcaatttgca tgccacgttt gcctgcagaa acaataattg cagaatattg ttgagcttct 600
tcagcca 607

<210> 323
<211> 521
<212> DNA
<213> Enterococcus faecalis

<400> 323
tctgtttacg ttagcgggtct ttctacaagg aggcgttact gatttaaaca cgaatcaaat 60
tggacaagtg attcctaata gcccagccgc agaagctggg ttgaaagaaa acgataaagt 120
cttatcgatt aataatcaaa aaatcaaaaa atacgaagat ttacaacca ttgtgcagaa 180
gaaccccgaa aagccgttaa cgttcgtagt tgagcgtaac ggcaaagaag agcaactaac 240
agtgcacca gaaaaacaaa aagtggaaaa acaacaatt ggtaaagtcg gcgtttatcc 300
ttatatgaaa accgatttac cgtcaaaatt gatgggcggg attcaggata ctttaaatag 360
tacgacacag atttttaaaag cactcggtc actattcaca ggcttttagtt taaacaaact 420
aggtgggcca gtcattgatg ttaattatc ggaagaagca tccaatgctg gagtaagtac 480
agttgtattc ttaatggcca tgttgtcaat gaacttaggg a 521

<210> 324
<211> 531
<212> DNA
<213> Enterococcus faecalis

<400> 324
ggcgacgaag ttaaagtga taataaaca attgtttctg gactcgatgt ttcggcagct 60
tcggttagtg agatgatttc aaagtttagta aaagaagatt tggttgagca ttctccttat 120

caaggggtac aattaactga aaaaggctta aaaaaagcga gtacgttaat tcgcaaacac 180
cgaatctggg aagtcttttt agtagagcac ttaaattaca cttggaatga tgtgcacgaa 240
gaggcagaag ttttagaaca tgttacttca cagacgcttg tgaaccgttt agcggattat 300
ttaaatacatc cagaattttg tccacacggt ggtgttattc ccgaagataa tcaaccatt 360
catgaggaga aacgccaaac gttaacagac taccctgttg gcacaaaaat tcggattgca 420
cgtgtcttag acgaaaaaga attactggat tatttagttt ccattgattt aaatattcaa 480
gaagaatata cgattaaaga aattgctgca tatgaaggac cgatcaccat t 531

<210> 325
<211> 342
<212> DNA
<213> Enterococcus faecalis

<400> 325
gatacgaaga agatagcgaa acggttcaag ataaagtcac agcgctgcca agtaccggtg 60
aatttgcttc tgacaacaga aaagcaaaaa gctgtgataa ggaacagAAC aagtcaaaga 120
aaatatggaa ccacgtgtag aataaacagt taaagggagg aaacaatcat gggctttatt 180
tgggcattaa ttgtcggcgg ggtcattggg gcaatcgtg gagcaattac taaaaaagga 240
tcatcaatgg cattattgca atatcattgc agggtaggtt ggttcaacaa ttggtcaagc 300
catttaggca catgggacaa gcttagctgg gatggctatt gt 342

<210> 326
<211> 512
<212> DNA
<213> Enterococcus faecalis

<400> 326
aagatggtag gtgtattcgt tttgacactc tttggcaagc aggtttgcaa gcttgttttg 60
aaacactaag tatgttagcc cctcatcatt cagcagaaat aaaaaagata ttagctattc 120
aggagcaacg ttttttgcaa aaacattttac ttgatgaagt cctttatcag gaactttatc 180
aggaattggc gcaatttgag gaattagtcg aacagggaat cagcagtcga tggctggagc 240
aattttttta tgattattta cgaaaaaatc tgaaaaagat cgaaccaatt ggtgatttaa 300
aacagttatt tcttgagcta aaacggaaga actataaaat tggattagca acttcagata 360
ctttgccagc gactatgttg attatggaat atcttggttt aacagaaatg tttgatttta 420
ttgcgacagg agatcgttac ttaccgaaac cagatgcgga catgctccaa gccttttgtc 480

agtcacgtca attgaaggcg acagaagtaa tt 512

<210> 327
 <211> 643
 <212> DNA
 <213> Enterococcus faecalis

<400> 327
 ttatttctgt tgagggcaaa gcggaagcag gtaaatactt gttcttcaca accttaaaag 60
 gaaccgtcaa acggacagcc gtaacagcct tttctaatat ccgtagtaat ggattaatcg 120
 ccattagctt aaaagaagat gatgagttag ttaacgtagt aacgactaat ggcaatcaga 180
 agatgattat cggaacacat gcaggatact ctgtcacatt tgatgaaaat actgtacgtg 240
 atatgggcgg gacagcatca ggtgttcgtg gaatccgtct ccgcgaaaat gattatgtgg 300
 tcggcgcagc gattctggat gaaaataaaag aagtcctagt cattactgaa aatggttatg 360
 gtaagcgtag aaaagcctct gaatatccag ttaaaggacg tggcggtaaa gggattaaga 420
 cagcaaatat cactgagaaa aatgggtccat tagctggttt aaccacggtc aatgggtgatg 480
 aagatatctt attgattacg aacaaaggcg tcattatccg ctttaacgtt gattctgttt 540
 ctcaaacagg acgcgcaaca ttaggggttc gtttaatgag aatggaagat ggtgccaaag 600
 tggtacaat ggctgttga gaaccagaag aagtggaaga aga 643

<210> 328
 <211> 402
 <212> DNA
 <213> Enterococcus faecalis

<400> 328
 ttgatcgttt tgacgtaatg ataaaaaaag cgaagaaaac ctaccaacgc ctagacttag 60
 aagaaaaggc cactctttta gaaggacaag cagctgagat tctaccaacg ttggaaggac 120
 cttatgactt tatttttatg gatagtgcc aatcaaaata cattgaattt ttacctgaat 180
 gtttacggtt gctgccagtt ggcggcggtt tgatgggtga tgatgtattt caagctggga 240
 caattttaga ccctgctgag gaagtaccga aaaaaaatcg agcaattcat cgtaaattaa 300
 accaattttt agatgtagtc atggctcacc ctgatttaac ttctacttta gttcctcttg 360
 gtgatggagt tattttaatt accaaagaga aagaaacgat ta 402

<210> 329
 <211> 608

<212> DNA

<213> Enterococcus faecalis

<400> 329

| | |
|--|-----|
| agcgactaga gagcatataa gtaaacgaac gggcggtgcc ttgtgggtgg tgacggagtt | 60 |
| agccataatg gctacagata tcgctgaggt aattggtggt gccgttgctt tgcaattatt | 120 |
| atttggtttt ccattattaa ttggtgtggt gataacaacg tttgatgttt tattactggt | 180 |
| gctactgaca aagttaggct ttgcgaaaat cgaagcaatt gtttcttggt taattgcagt | 240 |
| catctttttt gtttttgctt atgaagtggc attagcagat ccaaattgtg gtgaagtatt | 300 |
| acgagggtttt attccagaca caaaaatagc gacagataaa tccatgttat ttttagcctt | 360 |
| ggggatcggt ggagcgacag tcatgcccc aacttatat ttgcattctt ccattgcgca | 420 |
| agcacggaaa tttgatcgta acgatgatgt tgagaaagcc aaagcaattc gtttcactac | 480 |
| ttgggattca aatattcaat taactgttgc tttcgtcgta aattgtttgt tgttaatttt | 540 |
| aggaggagca ttattttatg gaaccaacag tgaattaggt aaattgttg atttatttga | 600 |
| tgctctga | 608 |

<210> 330

<211> 450

<212> DNA

<213> Enterococcus faecalis

<400> 330

| | |
|---|-----|
| aaattgttgc acgtatggaa aaaatgaaag acggaaattt aagtggatc caacgacata | 60 |
| atcaacgaga aaccaataat cattccaatc ctgatattga tattgagaaa tctcacttga | 120 |
| attatgactt agtcaatcct ggttcaatca attatcgga gaaaatcaaa caaatcattg | 180 |
| agagccaacg aatcagtaaa cgagcggta gaaaagacgc agtccttggtg aacgaatgga | 240 |
| taatcactag tgataccgcc ttttttcaag agaatacaga cacacaagca tttttaccg | 300 |
| atgttgctgc atatttctct gatcgctgcg gtcgacaaaa tgctgcctat gccacggtac | 360 |
| atttagacga aaccacgcc catatgcact taggaattgt gcctatgtac gaagggcgat | 420 |
| tgagcagtaa acaggtgttt agtcggcaaa | 450 |

<210> 331

<211> 360

<212> DNA

<213> Enterococcus faecalis

<400> 331

caatggaaca aaggccactc tgatgaaacg tcgtttgctg aaaatattcc agctaataat 60
 tgggaaaacg aattggccat gctctttatc ttaattaatg atggcgaaaa agatgtttcc 120
 agccgtgatg gaatgaaacg aacagtagaa acttctagct tttatcaagg ttggttgac 180
 aatgtggaaa aagattttatc ccaagttcat gaagcaatta aaacaaaaga cttccctcgt 240
 ttaggagaaa tcattgaagc caatgggtta aggatgcatg gaaccacctt aggcgtgtc 300
 cctccattta cttactggtc cccaggcagc ttacaagcga tggctttagt tcgccaagca 360

<210> 332
 <211> 526
 <212> DNA
 <213> Enterococcus faecalis

<400> 332
 ctgcggttaa agtcgttgca ttttctaaaa gggaaatgag tcccagataa agtgaaccgc 60
 tatacaagtt tcctacgga cgactataga tgatgctttc ttcataacgg gctaaaattc 120
 gttcctgttc tgcttcagtt tggtcggaga tttttgctaa taaggctttt ttgcccattt 180
 ttgtgtaagg aatatggaac gctaaagcat cataatctgc aaaatcaaga ccggttcttt 240
 ttttatgttc atcccagact tgggcaaaag attggatgta ggtttcgttt gacaaaggac 300
 catcgacat aggatacggg tggcctgttg gacgcaaaa gtcatagata tcttgcgtca 360
 gcatcacatt atcctctttt aaagccaaga tgcgcggttc actagcaact aacattgcaa 420
 ccgccccagc tccttggtga ggctcaccgc cagaatttaa tccatatttt gcaatatctg 480
 ctgctacaac caagactttt ttatctggat gtaaggctac gtgatt 526

<210> 333
 <211> 512
 <212> DNA
 <213> Enterococcus faecalis

<400> 333
 atccgactat gcgtttactg aagaacaagc tgaagcaatc gttactttac agctataaccg 60
 ttttaaccaat acggatatta ctgatttaca agaagaagcg aaaactttag aacaacaaat 120
 tgctgagtta ttgaacattt taaacaatga aaaagaacta ttctcagtca tgaaaaaga 180
 acttcgcgaa gttaaaaagc aatatggcaa tccgcgctta actcaaattg aagaggaaat 240
 ccaagaaatc aagattgaaa cagccgtgtt agttgcgcag gaagacgtgg tcgtaaccgt 300
 gacgcacgaa ggctatatca agcggagtag tattcgttct tatacagcat caaaaccaga 360

agaaatcggc atgaaagaag gcgacttttt attatatgct ggcgaagtca atacattaga 420
tcattcttta ctagtaacaa ataaaggga tatgatctat cgccccgtcc atgagttgcc 480
agatttacgc tggaaagaaa ttggcgaaca ta 512

<210> 334
<211> 604
<212> DNA
<213> Enterococcus faecalis

<400> 334
aggatcaatc gtaaattggtg tatacaaaac attttggtat tcatacatTT gataaattaa 60
acaatgcctg ctcttatatt gagaatgcag aaaaaactga agtcacgaat gataatccgt 120
ctgaacactt ggaacattta tttcaatata ttgtgaatga cgataagaca tacatgaaaa 180
aattagtttc tgggtcatggc attgtggatc caacaaatcc ttatgaagaa tttaaattaa 240
caaaattaca agcagcaatt caacgaaaaa tcgggtacac attcgatcca aaatcagaac 300
gattgcttcc gccaacgtta acagaattag aaaaaggcaa cgccgtttta gcacaccatt 360
taatccaatc attttctcca gaagatgatt taacgccaga aaaaatacat gaaatagggt 420
acaacacggt gatggaattg acaggtggaa agtataaatt tgtgatcgcc acacatgtcg 480
acaaagaaca ttacacaat catattattt ttagttcaac caacttaaaa acaggtaaag 540
cctttcgctg gcaaaaagga accaaaagag tctttgaaca aatttcggat aagattgcag 600
cgaa 604

<210> 335
<211> 451
<212> DNA
<213> Enterococcus faecalis

<400> 335
aagatggtga aacattggtg gttacaactg cagatcattc aacaggtggc ttgtcttttag 60
gcaaaggaga tcaatacaac tggttgacgg agcctttaca tgcggcaaaa cgcacgcctg 120
atctcatggc agaagaaatt attaaaaatg gtaatgtgga aaaaacagtg actgagtata 180
ttgattttca attaagtgag gctgaattga aagcagtga aacagcggcg gactcaaaag 240
atgttgaaaa aatcgctcag gcattaagaa agatttttga tgaacgttcg aatactgggt 300
ggactactgg cggacacaca ggagaagatg taaatgtcta tgcttatggc ccacaagcag 360
aagctttttc aggacaaaatt gataatacag accaagcgaa gattatTTTT ggcttagtag 420

atggcaccgg gcaaaaagct gagattaaag a

451

<210> 336
 <211> 543
 <212> DNA
 <213> Enterococcus faecalis

<400> 336
 gtttccgttc aaataaccac aaatcagaca acatttacag aggaacaatt aacggattat 60
 tggcagttgg ccttggttaa tagtcagtgc aatacaccgt tagttcagaa agtcctaaaa 120
 acacagacac cacaatttga agatcggaaa attatcttac ctgttgataa tgaagcagtt 180
 attccttata tgaagcaaca atattttacca attattgagg aactttatct ctcttatggg 240
 tttcctaaat ttcattattga accaaaaatg gatcaacagc aagctgcaga agtgttgaaa 300
 aagtttgaag agcaaaaatt agaacaagcc gcagcctttc aacaacaagc tgctgaatcg 360
 cttgttaaac atgaacaaat gaaaaaagaa aaacaacaac aagcgcctgc gtttgatggg 420
 ccaattcgtt taggtcggaa tattcccaat gatgaacca ttatgcccac gggaaatata 480
 ctggaagaag aacgtcgtat aacgattgaa ggctttatct ttgataaaga agtgcgtgaa 540
 ttg 543

<210> 337
 <211> 578
 <212> DNA
 <213> Enterococcus faecalis

<400> 337
 aattgcagga gggtcacac cagagatctt acagctagtt aaaaaagcac taaaagaagc 60
 cgagcaaccg ttgcagttta ttgtatttga taaaaatgaa aatcttgata ctgaaaatct 120
 ctggaaatat gttcattgct cagatgaggc cgcggtagca caggaaagctg tcagtttagt 180
 tgcaaccggg caagcacaaa ttttattgaa aggaattatt cagaccaca cattactaaa 240
 agaaatgttg aaaagtgagc atcaattaaa aaataaaccg attctttccc atgtagcaat 300
 ggtggagctg cctgcgggaa aaaccttctt gttaaccgat tgtgcgatga atatcgcccc 360
 cactcaagcg accctcattg aaattgttga aaatgctaaa gaagtcgccc aaaaattggg 420
 actgcaccac ccgaaaattg ctttggttaag cgcagcggaa aatttcaatc ctaaaatgcc 480
 ttctctgtt ttagcaaaag aagtcacggc acattttaat aatcaacaag aggctacggg 540
 ttttgggccc ctttcgcttg atttagcgac ctctgaag 578

<210> 338
<211> 320
<212> DNA
<213> *Enterococcus faecalis*

<400> 338
aatgcgtgat caggggtgat gataaaactc ttggaaagag gcagaat ttt gaaagttgca 60
tatgcaagag tttcatccat tggcaaaact tggaacggca aattcaagag ttaaaaaaat 120
taggagcgaa aaaaatat ttagagaaaa aatctggcgc aagtattgaa caacgactaa 180
tttttacaga agctatctat tttgtgagag aatccgatat ttttatggta gaagccattg 240
accgattagg cagaaattac gatgaaatta ttcagacggg taattttattg aaaaataaaa 300
atgttcgact cataattaca 320

<210> 339
<211> 693
<212> DNA
<213> *Enterococcus faecalis*

<400> 339
ctcaacagct tcaacaatcc attcaaattt tacaatttaa tacggaagaa ctggctgcct 60
ttgttgaagc gaaagcacta gagaatccat taattgattt acaagtagac acgcagtaca 120
ccacagattt tccgataact agtcgttctt acaccaacca agacgaagaa aataattata 180
tgaatcaaat tccagactat catttatcat tatttgagtc ttttaattgat caaattcatt 240
tgaattaccg cgatacatat ttgcgaacat tgggtattggt tttagtagaa tatatagacg 300
tgaattggta tttaaagatt tcgttagaag aagcggcaga gaaaaccgaa gcaagcgcca 360
ttcaaatgct agatgcatta actttgttac aacagctaga tccagcaggt gtgggggcac 420
gcaatttaca agaattgttg atgctacaaa cagaacgaga cgataccgag cctaacttag 480
cgtatat tttt attggaggaa gagtttgatg ccttagtgag tcgtaaattg ggcccgttag 540
ctaaaaaatt cgggattgaa ttagcagaaa ttcaattgat ttttgattat atacaaacgt 600
tatcgccagc gccagggaat atttttgatg cgaccgagga attgtatatt cgaccagatt 660
taactgtccg aatcaaggaa gatcgaatag tgg 693

<210> 340
<211> 210
<212> DNA
<213> *Enterococcus faecalis*

<400> 340
 aggttttagaa gtgggggagt ttgtacacac gctaggagat gcccacttat atcaaaatca 60
 tgttgaacaa atgcaagaac aattatcacg agaagtctgt tctttcccaa cgctcgtttt 120
 gaatccagac aaggcttctg tttttgattt tgatatggaa gatattaaag tagaaggcta 180
 tgacccacat ccaacgatta aagcgccgat 210

<210> 341
 <211> 504
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 341
 aacgcacatc tgaaagctac gaaaaaactg tcaaccatat gaaagatgta ttgaatgaaa 60
 tctcttctcg catgcgtaca cattcagttc catggcatac agcaggtaga tattggggac 120
 atatgaactc agaaacatta atgccttctc tattagctta caactttgca atgctatgga 180
 acgggaacaa cgttgcctat gaatcttctc cagcaacttc tcaaatggaa gaagaagtag 240
 gacatgaatt tgctcacttg atgagctaca aaaatggttg gggacacatc gttgctgatg 300
 gttcttttagc taacttagaa ggcttatggg atgcccgtaa cattaaatca ttaccatttg 360
 ctatgaaaga agtaaaacca gaattagttg ctggcaaatac agattgggaa ctattgaaca 420
 tgccaacaaa agaaattatg gacttattag aatcagctga agatgaaatt gatgaaatca 480
 aagctcatto agctcgttca ggta 504

<210> 342
 <211> 400
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 342
 atggaggggtg ataacatgaa tatcattgac gagctagcat ggcgtgatgc aatcaatcaa 60
 caaacaaacg aagaaggact aagagaactt acagaaaata cgagcatttc gctatattgc 120
 ggtgtcgatc caactggaga tagcatgcat attggacatt taattccttt tatgatgatg 180
 aaacgattcc aattagcagg tcatcaccca tacattttta ttggtggcgg aactggaaca 240
 attggtgacc caagtggacg aacaactgaa cgtgttttac aaacgatgga agctgtgcaa 300
 cataatgtgg acagtctttc aaaccaaatag aaaaaattat ttggtaaaga tgctgaggta 360
 acaatggtga acaactacga ttggttatca gaactatctt 400

<210> 343
 <211> 585
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 343
 caggaggaac attggttggt cttcacaaaa atcaaccagt aactattacc tatggcaatt 60
 tgaatgctag ttatttgggt aaaaaaattg ctagtgctga attccaatat acagtgaagg 120
 ccacacctga ttcaaaaggt cgattgaatg ctttcttaca tgatgatcca gtggccacaa 180
 ttgtctatgg aattaacatt gaccctcgta caaagaaggc tgggtgctgag attgaaatgc 240
 tcgttcgctt ctttggagaa gatggcaaag aaatcttgcc aacgaaagag aatccatttg 300
 tattttcagg tgcttcatta aattcacgtg gtgaaaacat tacgtatgag ttcgtaaaag 360
 taggaaacac ggatactggt catgaaatta atggatcaaa agtagctcgt catggaaata 420
 aagtttatcc taaaacggat attgatgtag ggacgaatgg gatttcaata agtgactggg 480
 aagcagttca aggcaaagaa tatattggcg caactgttat ttcaacacca aatagaatta 540
 aattcacttt cgggaatgaa attgttaaca atccagggtg tgacg 585

<210> 344
 <211> 544
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 344
 cgacagaact tgctaaagta gatccaaaaa cggtaacaaa acaagggatt cgagatacct 60
 ttgatgcaga aaaagtgacg attgatattat ccaaagtga agtttatcaa gcagacgcaa 120
 gtctaaacga gaaagactta aaagctgttg ctgcagcgat taattcagga aaagccaaag 180
 acgtgaccgc ttcttatgat cttaatttag accaaaacac cgtcacagca atgatgaaaa 240
 ccaacgcaga cggctccggt gtttttagcaa tgggggtataa atatttactt gtcttgccgt 300
 ttgtagtga aaatgtagaa ggcgattttg aaaatacagc tgttcagctg acaaacgatg 360
 gtgaaacggg aacaaataca gtgattaacc atgtgccagg tagtaatcct tccaaagatg 420
 taaaagcaga taaaacggg acagttggca gtgtttctct acatgataaa gatattccgt 480
 taaaaacaaa aatttattat gaagtgaat cttccgaacg tccagccaac tatggcggaa 540
 tcac 544

<210> 345
 <211> 341

<212> DNA

<213> Enterococcus faecalis

<400> 345

```

cttctttcgt gctttcaacc acaatagatt gctctttatc agccaacagc caatggagag      60
gggataacg g aagttcatca ctaaaattaa tatttactaa attaagattc ttcaataaatt      120
tttttgcttc atctacagta gagcattggc ccaataccca aggaataaac tcaaatggag      180
aaacattttc ttttccttct tcaatttttt tataatctgc atagcctgaa aagtttaatc      240
cagccattcc taatcctttt tcatttattg catcataata aagcggataa tcagcaatcc      300
cagcagcaat tccaattatt gcaaaatgat gatctaaatt t                          341

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<210> 346

<211> 594

<212> DNA

<213> Enterococcus faecalis

<400> 346

```

aaacctggat gatagtgata ggaagtttat aggtaaatat tttaatgttt cggaagggaa      60
aaaattacca gatttttaaac ctgaagaagt taatagttct attttaaaaca ttaatatattt      120
aaacaaagat tttaagtctt ttaattggcc atataaaaaa attttatctc atattgatcc      180
agtgaagaa caactaggga aagatataac catagctcta attgactcgg ggattgatag      240
gcttcacct aatcttcaag acaataacct aagattaaaa aaccatgtta atgatattga      300
gttagatgaa tatggtcatg gtacacaagt tgctggagta atagacacga ttgctccaag      360
agtaaattta aattcttata aggtgatgga tgggacagat ggaaactcta taaatatgct      420
taaagctata gttgatgcta caaatgatca agtagatata ataaatgtga gtcttggatc      480
atataaaaat atggaaatag acgacgaaag atttactgta gaagcattca gaaaagctgt      540
taactatgca agaaaaaata acattctaatt tgttgcatca gcaggaaatg agtc          594

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<210> 347

<211> 504

<212> DNA

<213> Enterococcus faecalis

<400> 347

```

caaggagagc atagtgaatg tgctttggca tgtatcacta tgctacttaa ttattatggt      60
aatcaaagta cactagtaga actaaggga aaatatgggg tgcccaaagg aggactaact      120
atcaagaata ttcgtactgt ctttgacgaa tatggatttg atgtatcgac atttaaatca      180

```


agtttttcaa attatttaga tcttccgact cctgtaataa gttattggaa taatcaacat 240
 tttgtggtca tagagaaaat aaaaaagaag aaagtattaa tcttagatcc tgcaagtaat 300
 aaacgctgga ttgatatttc agaattcaaa aaaaattttt caaatatatt aatatacgca 360
 cataagaaaa agactaaaaa agaaggcaaa aggaaacagt tttttttaa gtcatttatt 420
 tttacaaaat tcaaaagata tttctttagt ttaataatat tatcatttgt ttcacaactt 480
 ttattactct taattcctat tgca 504

<210> 348
 <211> 562
 <212> DNA
 <213> Enterococcus faecalis

<400> 348
 gttagggcac ttagcttttg gattatttaa taaagttaga ccagagtcac taatatttgg 60
 gtttataaaa ttttcgtggg aaaatcagtt taagatcaga ttaaatacac agtggggatt 120
 ttttgggtgga ttatttagat ataaaccaac tacgtttaat aataagaaaa ttctgaggtt 180
 gttaaccggg ggaccaatat ttagcttttt ttttacatta accttttttg taaaaattga 240
 cttttttcaa tatttttctt tatttaattt ttcgatattt ttaattactg cagttccttt 300
 taattttaac gggtttatga atgatggata caatatatat aaattagtta ctaaggatta 360
 tatttttgaa atgtattata ttgtatcaaa tagcttactt aataaatata atcagtcaac 420
 tttcttaaat acaactgagg tatgcaaaat aataaaaaaa aataaagaat taccattata 480
 tgtgctaaat acattcttat tgtatgttat atatgagtat ttaatagaca aaaataatag 540
 gaaattaaaa ctaatatacc ca 562

<210> 349
 <211> 402
 <212> DNA
 <213> Enterococcus faecalis

<400> 349
 tggaataatt aagtgtagtt cctagttttg aagaactaag tgttgaggaa atggaagcga 60
 ttcaaggtag tggagatggt caggctgaga caacaccggt gtgtgctggt gcgcgacag 120
 ctgcagcaag tagtgctgct tgtggctggg ttggtggcgg tatttttact ggagtaactg 180
 tagttgtgtc tttaaaacat tgttaaaata tactataaaa cttagtgagg tgaagcacag 240
 tgctaaataa ggaaaatcaa gaaaactatt actctaataa attagaactt gttggtcctt 300

cttttgaaga gttaagttta gaagaaatgg aagcgattca aggtagtga gatgttcagg 360
 ctgagacaac tccagcatgt ttaccatag gcttaggagt ag 402

<210> 350
 <211> 562
 <212> DNA
 <213> Enterococcus faecalis

<400> 350
 agcaaagtgg taacgagaag tacgacatta aaaatttaca agcttgaaa gaaagaaaaa 60
 gtgttcttaa acaagatgat ttagactact tgattaaata taaatatgaa tcaactggata 120
 attttggatt aggaataaca cctattgaaa actttcctga taaagaagtt gcaattcaat 180
 acattaaaga tcaatcatgg tatatttttt ttgaatccat tttagattct tataatgata 240
 gtgaagagca attattagaa gtagatgcta gttatccttt tagatatttc ttacagtatg 300
 ctcgtttatt tttacttgat ttaaaactcag agttaaatat ttgtacaaa gaattcatta 360
 ttaatttatt agaaattcta acacaagagc ttattcactt aacaagtaaa acattagtgc 420
 tagatttgca tactttttaa aaaaatgaac ctctaaaggg aaatgatagt agcaagcgat 480
 ttatctatta tctaaaaaaa agatttaact ctaaaaaaga tataatagct ttttatacat 540
 gctatcctga gttgatgcgt at 562

<210> 351
 <211> 590
 <212> DNA
 <213> Enterococcus faecalis

<400> 351
 tagttggaat gaccgagaac gatggctcac cacgaaaaat caatttaa at ggtttagggg 60
 aagtttttat ctataaagat catgtttag caacatttaa tgaaaaagtt gaatctttac 120
 ataatgtgaa tgggcatttt tctttcggga ttaaaacgct tatcaccaat agttcgcaac 180
 cgaatgtgat agaaacggat ttcggaacag caacggcgac tcaacgtttg acgattgaag 240
 gagtgaccaa cacagagact ggccaaattg agcgagacta tccgtttttt tataaagtag 300
 gcgatttggc tggagagtca aatcaagtac gttgggtttt aaatgtgaac ctcaataaat 360
 ccgatgtcac agaagatatt tcaattgcgg atcgacaagg aagtggtaa caattaaata 420
 aagagagttt tacatttgat attgtgaatg acaagaaac taaatatatt tcaactgccc 480
 agtttgagca acaaggttat ggcaaaattg acttcgtaac agataatgac ttttaatttac 540

gtttttatcg ggataaagca cgctttactt cctttatcgt ccggttacact 590

<210> 352
 <211> 648
 <212> DNA
 <213> Enterococcus faecalis

<400> 352
 tcaacgtcac aaacaagaac ctgatatctg tgaaaatgca aatcaattga atgaagctgt 60
 aaagcccaaa accggaaaacg aaaacaaaca accaaaaata ccgaagaaaa aatctaatta 120
 tagcaagtat atattcgcac tgtttaccgc acttattcta gtaattgtcg ctactggcgg 180
 ctatatgttt tatacattaa aacagcaaga agtagaagct caagccaaat atgaaactgc 240
 tgtaaaaaat ctcatggctt caatccaaga agagcaagac caaagtggaa tttcaacgaa 300
 aatagatact ataaatgacg gagaaaataa gtgccttatt taccgtccag tttatgaaag 360
 tactgttcct tttaaaaatg caaaccagct cttagacgag cttgctcaaa agcaacaaaa 420
 gaagcatcgt gaaaaagaag tgcttacagt tgccagaata aaagcaacag caatatcttc 480
 taaaattggt cagtatagaa ttgaagcaga tagttttatc tgggatcgca gtaaggaaaa 540
 ttttaaaaag ccagacagta tttctgagaa agccatttat gtttccgaaa aaactggtaa 600
 agaaatcaca aataaggatt tgattccgga tgaagggaagt ctcttagg 648

<210> 353
 <211> 520
 <212> DNA
 <213> Enterococcus faecalis

<400> 353
 tcggaagtat tgcgtttggt gggacaacat tagcttacgc tgatgaagtg cataatagta 60
 taaatcagga tatacaagat tctggtagta caattattgg agaaaatgat tcttctacca 120
 aatcagctga gtataaaatg attcatgaaa ttgatggaac taaaattagt aacggtgaaa 180
 atagtaaaga aacaactaca agttcaggaa ctatactggc tgaagaagca atagaaagtt 240
 caaatcaaaa aaattcaaag acaagtgaag tcgaacagga tcttcataaa gatgtatcag 300
 gatctgaatc agtaaaacaa gtagaaactt ctgattctat aaaaaaatct gaagaatcag 360
 ctgttaaaac attaaatctg gatgattcac aagagaatac taattcaata actaccaagg 420
 cagaaaatga tgcgctatct acagttaatg atgaaaaagt attaaatgaa agtgatagta 480
 ttatcaaatc aattccttcg gaaacagaga atgtcgataa 520

<210> 354
 <211> 668
 <212> DNA
 <213> Enterococcus faecalis

<400> 354
 ttgtcttttg gcttctctct ttttcttgc ctatatTTTT agtcttttga ggcttacttt 60
 ttttcttttt attattaacg agtacgtcag atacttcaaa aaatgattgt attcagccaa 120
 gtataaataa tccaactgat gcgacagata cacctaaatc gatcgagcag tttgtaaaaa 180
 gccataaaga tgcttacctt ttatcatgga aagcaggtgg ctttttaccg tctgctagta 240
 tttctcaaac gatggttagaa aatgggttta attttactaa tccatcgggg acgtcatttt 300
 ggcaggcaca caatatgggc ggtgttaaaa cgtcaaaaaa agaagatttt cctgtaactt 360
 tagcaacatt cggccaagat tctgttgata tttctggtac aaagccaggg tcaaacgtcg 420
 gtgatggcac tgggtgggca tatacctggg ttaaagacta caatgctgga attgttggaa 480
 aagcagaatt tatggcacac cagacactgt atacaggtgc tatcaataat actgacggat 540
 taagtacttt atcagctatt tattcaggag gatgggctac agaccctact tacctcatga 600
 agttacaggc cacatataat agcttaggca agcagtttca atggttggac caagaagcaa 660
 tacagaaa 668

<210> 355
 <211> 517
 <212> DNA
 <213> Enterococcus faecalis

<400> 355
 ctatagattc cctatcttgt tggacaaaag ataaataaag aaatatTTTT tttcgataga 60
 atacgttaaa atatgaatag atatagatag taattatatt atctataaat agtagagtat 120
 aacgatcttt tatttttggg ttttctataa attttaagta gtaagaaaat ctttttcggt 180
 caaacttttc tataatctct aaatttttaa tttgaacaga attagtgtgaa ataagcatat 240
 aaaaatttaa tagtaattgc tccttatcag attttagacg tactctttca attatatcca 300
 tgatatattc atcgatggta gagcttttat cagcaatttt ttctaattca gagtttatta 360
 tatccaaatt atacacaatc actgcctcat ataaatcatg ttttgtttta aaaaagctat 420
 atacggtagt agtgcgtggt ttagcttcat tagcaatato taaaagtttt gttttttcat 480
 aaccaaattt agaaaagtgt ttcattgcgg taaatat 517

<210> 356
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 356
atgtatgtat cttttgttct aagttgtttg cttggatttt ctgcctacag tctattaaat 60
aggctaaatt cgttgaatt tgtggatggt tggtagaca aagaaacaca aaaaatcaca 120
ctaaaacgct gtttttatga tacgtctttc aagaaacaaa cactaaaaga gttagaacga 180
gtatatttcc aattaaaaga aataatcaac gtgcaaataa acaagcggtc tttaaatacg 240
aatgacatac gtaatgtacg agaactagag gaaaaacaac aagaaataaa acgattcatg 300
ttagacgttt tagaagatgc ttattggaaa gaattagcaa atatgccaga agaccaacga 360
cacttagacg attgggattt 380

<210> 357
<211> 320
<212> DNA
<213> Enterococcus faecalis

<400> 357
aaagtactac cttttattgc cttagtcggc ttgttattgt tgtcagggtg tggaacagat 60
atgaaaaaga tattgactgc cgatggtggt aaatggaaag tggaagaaac acgtgcaact 120
tacacttttt ttgatgacgg taaattttca gctaactgact cagaggatag tgtagtgagg 180
acatacactt atgatgaaaa aaataaaaaa ataactttg acattactag cagaaactct 240
ttcattatgg aaaaagtaga atacaaagat aacaagatta caggggaaat tggcgaaaaa 300
caaagaacac ttataaaaca 320

<210> 358
<211> 503
<212> DNA
<213> Enterococcus faecalis

<400> 358
tgaacaaaaa gcacaggata gtgtaaaaga agttactgaa aatgttactc aaactatttc 60
aaacgatcaa cgtataccag ctgattttgt taggcacgtg gatggcgata ccacagtatt 120
aaaaattgac ggaaaagaac aaaaagtctg gtttttatta attgacacac ccgagactgt 180
gaaaccgaaa acaaaagtgc agccgttcgg attggaagct agcaaacgca caaaagagct 240
tttgtctact gtttcagaaa ttacgtttga atatgataag ggcgataaaa cagatcgtaa 300

cggacgagcg ttgggctaca ttttcgtaga tggaacatta ctacaaaaaa cgcttgtaag 360
 tgaaggatta gctcgtgttg cctatgtaaa agagcctaca actaagtatt tggcagaact 420
 agagcaagcc caagaacagg ctaaaaatga gtcactcgga atctggagca taccaggtta 480
 tgtgacacaa cggggggttta gta 503

<210> 359
 <211> 220
 <212> DNA
 <213> Enterococcus faecalis

<400> 359
 tgatgaaaat ttaaaagaag aagcagaaca attatttgat gatttagggg taaatatgac 60
 aagtgcatt acgattttct taaaacagtc tattaatgag caagcaattc cttttatgat 120
 taataaggga aacaaagaga ctctacaagc attaaaagac attaaagaag gaaatgttca 180
 tgggtggattt tcttccgtgg aggatttaat ggaggattta 220

<210> 360
 <211> 380
 <212> DNA
 <213> Enterococcus faecalis

<400> 360
 tcaaatcac gtaagccttc tttcgtgctt tcaaccacaa tagattgctc tttatcagcc 60
 aacagccaat ggagagggga taacggaagt tcatcactaa aattaatatt tactaaatta 120
 agattcttca ataatttttt tgcttcatct acagtagagc attggcccaa tacccaagga 180
 ataaactcaa atggagaaac attttctttt ctttcttcaa tttttttata atctgcatag 240
 cctgaaaagt ttaatccagc cattccta atcttttcat ttattgcatc ataataaagc 300
 ggataatcag caatcccagc agcaattcca attattgcaa aatgatgac taaatttcca 360
 acttctcgaa atgaaaactt 380

<210> 361
 <211> 511
 <212> DNA
 <213> Enterococcus faecalis

<400> 361
 cattattttc attaggggat attagagata ttcttctcct tataaattat ttttttacgg 60
 gaaagattga agacttattt cataagccgt tacatgatta tgagaaaaaa ttttcagaag 120

atatccaaat agaacggata gatatgttat tatctcaaaa ttatgatcca gaaatttatt 180
 tattttttata tgaaaataaa attttagaat atgttgtaaa tggtaatgta caagaattaa 240
 gtaatatgat atttaaaacta agtaatggtg ttgttcctgt ggtagtgagg gataacgtac 300
 gttctgaaaa gaattattca atagttgtat ttgagaagtt agcacaagca gctataaata 360
 tgggaatgga ctttaataaat gcatatcaga gtcgagatag ttttataagg aaaaatgaac 420
 tatgtataaa tttaaaagaa gtattaaaag ttagagatac tgctatagta ttttatacct 480
 ctgaaatagg aaaagctaaa gtaaggaatc t 511

<210> 362
 <211> 526
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 362
 ttgcgatttc tgtttagtag accattatct ttgtaatagg actttatggt agtaaaataa 60
 aaaaataaat cacaattaag gttctggttg ttattaatct atctcatgaa gcattagatg 120
 aattagttct agaagtacct gttgtactag ttaaaaatac tgttaaatca aattttttgt 180
 ttaaaaagaat cattaagttg gtgcctaact ataaaatcaa attgactaaa atccaataac 240
 attgggggat actctgtaaa tcgtgtgtcg cagtacgtta gtcttgtaat aaatagatct 300
 taattaggag gggtttctat gaaaaatatt ttactttcta ttctaggggt attatctatc 360
 gttgtttctt tggcgttttc ttcttattct gtcaacgcag cttctaataa gtggtcgtgg 420
 ccactgggca aaccatatgc gggaagatat gaagaaggac aacaattcgg gaacactgca 480
 ttaaacggag gaggtactta tttccatgat gggtttgact ttggtt 526

<210> 363
 <211> 505
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 363
 aatcaagccg ctgaaaagaa agaaaaatta gcaattgtga caacgaactc gatcttatcc 60
 gatttagtga aaaatgttgg gcaagacaaa attgagctgc atagtattgt gccaatggg 120
 acagaccctc acgaatatga accgttacca gaagacattg cgaaagcttc tgaagcggac 180
 attttattct ttaacggctt gaacttagaa acaggcggaa atggctggtt taacaaatta 240
 atgaaaacgg ccaaaaaagt tgagaataaa gattactttt ctacaagcaa aaatgttacg 300

ccacaatatt taacaagtgc cgggtcaagaa caaacagaag atccgcatgc ttgggttagac 360
 attgaaaatg gcatcaaata tgtagaaaac attcgtgacg tgtagtaga aaaagatcca 420
 aaaaataaag atttctatac agaaaacgcg aaaaattata ccgaaaaact tagcaaacta 480
 catgaggaag ccaaagctaa atttg 505

<210> 364
 <211> 557
 <212> DNA
 <213> Enterococcus faecalis

<400> 364
 aaatgggtga aggaagatta gcaaattatt ctgcttcagg aaatacgttt caagaaaatc 60
 cgggatatac gaagaattat aatttctcgg atttacaatt caaccctaaa gcaataactg 120
 gtgatgtgtt acaggggaaat acaattgatt ttgaggttta tgggaaacat aatattgcag 180
 cttcaactgc aaactgggaa attcgtcttc aattagatga acgattggcc cagtatgttg 240
 aaaaaattca agttgatccg aagaaggcg taggaaatag tagacgaact tttgtaagaa 300
 ttaatgatc gcttggcaga cctacaaaca tttggaaggt taattacatt cgagcaaag 360
 atggactatt tgctggggca gaaacaactg atacacaaac tgctcctaac ggtgtgatta 420
 catttgaaaa aaatttagat gaaattttta aagaaattgg tgcagataat cttaaaagcg 480
 accgtttaat gtatcgtatc tatttggtta gtcacgaaga tgacgataaa attgtacctg 540
 gaatagaaag cactggt 557

<210> 365
 <211> 523
 <212> DNA
 <213> Enterococcus faecalis

<400> 365
 aggtacaggc atctttgttg gaagttcatg tctattttct tcactttttg tagccgcaga 60
 agaacaagtt tattcagaaa gtgaagtttc aacagtttta tcgaagttgg aaaaggaggc 120
 aatttctgag gcagctgctg aacaatatac ggtttagat cgaaaagaag acgcgtgggg 180
 gatgaagcat cttaagttag aaaagcaaac ggaaggcggt actgttgatt cagataatgt 240
 gattattcat ttagataaaa acggtgcagt aacaagtgtt acaggaaatc cagttgatca 300
 agttgtgaaa attcaatcgg ttgatgcaat cgggtgaagaa ggagttaaaa aaattattgc 360
 ttctgataat ccgaaaaata aagatcttgt ctttttagct attgacaaac gtgtaaataa 420

tgaagggcaa ttattttata aagtcagagt aacttcttca ccaactggtg accccgtatc 480
attggtttat aaagtgaacg ctacagatgg aacaattatg gaa 523

<210> 366
<211> 400
<212> DNA
<213> Enterococcus faecalis

<400> 366
ctggttcaaa agaagccatt gatgcccgcg ttcattttaat taaaaaccaa atcggcgaaa 60
caacgtctga ttttgatcgt gaaaaattac aagaacgttt agctaaatta gctggcgggg 120
ttgctgtcgt taaagtcggt gctgcaactg aaacagaatt aaaagaatta aaattacgaa 180
ttgaagatgc attaaacgca acacgtgccg ctgtagaaga aggcattggtt tctggtggtg 240
gtaccgcact tgtcaatgta attggtaaag tcgctgcgct agaagctgaa ggcgatgtgg 300
caacagggat caagattgtc gttcgtgcat tagaagaacc aatccgtcaa atcgtgaaa 360
atgctgggta tgaaggatca gtgattgttg acaaactaaa 400

<210> 367
<211> 264
<212> DNA
<213> Enterococcus faecalis

<400> 367
gatcgctcg taattagagt cgcgaaagaa gaagaaaaaa ctgttgaggg aattgttctt 60
gcatccgttg cacaagaaaa accacaaaca ggtgaagtta tcgcagtagg tgaaggtcgt 120
gtgcttgaaa atggcacaaa agttccgatg gaagtaaaaa ttggtgacac agtaatgttt 180
gaaaaatatt caggaacaga agtgaataac gaaggcgtag aatacttaat tgtatcagcc 240
aaagacatta ttgccactgt tgaa 264

<210> 368
<211> 505
<212> DNA
<213> Enterococcus faecalis

<400> 368
atctcgcgga acaattagat agtattcttt tacaagtcag tgaagaagat gaactaatta 60
tttcagatga tgggtctact gatcatacgt tggaaatfff gagaacgtat gcagcgaatt 120
atccccaat tcaattgtta caaggtccag ggcaaggagt gattgctaatt ttgcatattg 180
cgcttacgca tacgaaaggc gaagtgatat ttttagcaga tcaagatgac gtttggttgc 240

caaataaagt aacaacagtg acagaatatt ttgaaacgca ccctgacatc caagtggta 300
ttagtgactt gaaaattggt gatgcggtt tacaagttac caatccctct tattttaagt 360
ttcgaaaagt caaaccaggg ttttggcgaa atgcgataaa aagtggctat attggggcag 420
gtatggcctt tcgtcaagag atgaaaaacg tcattttacc cattccgcca gaagttccta 480
tgcattgatg gtggattggc ttatt 505

<210> 369
<211> 688
<212> DNA
<213> Enterococcus faecalis

<400> 369
tcggctctaa tggatgttc cattacatta acaagcgtag cgttgccatc cgcagcattt 60
gcagatgaat acgatacaaa gattcaacaa caagatcaaa aaattaatgc gttactagc 120
caaatgtcag atgcagaagc aaaagttgcc gcgattgaaa atgatatggt tgaaacggcc 180
aaacaaatcg atacattaac agctaaaaag aacaagctat catcagaagt atctaaatta 240
tatagtgaat tttctgattt gaatgtccgt attcaaaaac gtgaagtaca aatgacaaaa 300
caagcacgcg atgtccaagt gaatgttcaa agtgattcaa ttattgatgc tgtcttagat 360
gcagattcag tagcagatgc aattggtcgc gttcaagcgg tctcaacaat gatgagcgcc 420
aataatgaat tactagaaca acaaaaagaa gacaaagcga ctgttgaaaa gaaaacaaag 480
aatgttgaaa aacaaattgc tgaattagaa gcagcaacaa agaattaaa tgataaaaca 540
gaatcattaa aaacattgaa gattcaacaa gaagtggcta aaaatgattt agaagcacia 600
cgttctgaag aacaaggga aaaagacggc ttcattaac agaaaaaaga agcggaaaaa 660
cgtttagcag aagaacaagc acgtcaac 688

<210> 370
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 370
gcttcattag cattagaaca atcatcagct gaaagttcta agctggctt agaaaaacaa 60
aaagcagctg ctgaagcaga gcaagcacgc ttagctgctg acaaaaaagc tgcagctgaa 120
aaagccaaac aagctgctgc aaaaccagct aaagctgaag tgaaagcaga agcaccagtt 180
gcctcttcat caacaacaga agcacaagca ccagcaagct caagtcagc aactgaatca 240

| | |
|---|-----|
| agcacgcaac aaacaactga aacaactaca ccaagtagag ataatagtgc aacagaaaat | 300 |
| actggctctt cttcatcaga acaaccagta caacctacaa caccaagcga taatggaaat | 360 |
| aatgggtggc aaactgggtg tggaacagtt acaccaaac cagaaccaac accagcgcct | 420 |
| tctgctgac caacaatcaa tgcattgaac gttctacgac aatcattagg ttacgtcca | 480 |
| gtagtatggg atgcaggttt | 500 |

<210> 371
 <211> 529
 <212> DNA
 <213> Enterococcus faecalis

| | |
|---|-----|
| <400> 371 | |
| ttaactgaac aagaaaagca agcaatggaa aaagaagcat tagcattaaa taaagttttt | 60 |
| cctgaaaatc aagcagatgc ggcaaaagta acggaaatga tcaatgtcaa aaatcctacc | 120 |
| gaaaaacaaa agcaacaaat gagcgattac gttgtaggac ttatcaatga tggtcgcgaa | 180 |
| aagcttggtg tacaaaagtt gaagatttct aaccaagcta tgaaatttgc ttgggatgta | 240 |
| gcaaaatag ataatccaa agaatttgat catgacgtaa atgcgatcaa tcgtgcagca | 300 |
| aaagaaaatg gttttaaaga attccctgga caaaactttt atgaaaacct aagtatggga | 360 |
| agatttacga cacaagaagg taaagtttct atgtatgact ttgaaaagc tgctcgaaat | 420 |
| gcacttgtaa gcatgtgat gaacgatgga cattctggct attcccattt agattcttta | 480 |
| ttagatgcaa atgaaacaaa catggcagtt tctatttcag gagatttaa | 529 |

<210> 372
 <211> 558
 <212> DNA
 <213> Enterococcus faecalis

| | |
|---|-----|
| <400> 372 | |
| acaaccaaca gtgaaagcta cacaacaac ggagcaagcc attactgaaa aacagcaaca | 60 |
| agtaatagag aaacaagcaa ttgtcgatca aaaacaacaa gttgctgaca ctgcgaaaaa | 120 |
| agaaaaagac accattgatc aatctgttaa agaccaacaa gcagtggctg atcaaaacaa | 180 |
| agacgcattg gttcaaagtc aacaagcagt gactgacca caagcagttg tagacgaagc | 240 |
| taaaaaagtc gtggatgaag caacaccttc agccattgaa aaagccaaag agcaagtggc | 300 |
| tactgatata caggctgttg atgaccaaca aaaagtagta gagcaagctc aaacagacgt | 360 |
| taaccaacaa caagctgttg ttgatgaaaa agcaaaagaa acgactgctg ctaaagtgca | 420 |

aatgataaa gatcaacaag cagtaacagc tgcaaaacaa gaacaagtca agcttgaaga 480
attagcgaaa aatgcggaag cggaataaagt aaaggcagaa aaagaacaag cagcaaaaaga 540
agcagaattg gctaacaa 558

<210> 373
<211> 687
<212> DNA
<213> Enterococcus faecalis

<400> 373
cattggtggc tatttcattc gtgaattgga agccactaca atttccgatt ttaaaaaaaaa 60
tatggattcc caagttgtcc aattgtcaaa cacgttaagt acgcagatga gcaacaaaga 120
tctcgaaagt agtgacgttg atgcaaatat aaaaaagcg ttatctgatt tttcaaatgc 180
agatatttct gaagcgagaa ttgtcgatga taaagggatt attcgggcaa ccaatgattt 240
aatcaacaa aatattattg ggaaaaagaa tgattatcgt gatttaaatg actttacgag 300
taaaaaatat caagcttttag ataataataa acgcgtgtat gtgaatgtcc agccgattca 360
atcgctact ggagaaacag tgattggcgt cttttatgtg aaaagtaatt tagaaaataa 420
ataccaagaa attaccaaca cagcaagtat ctttttcaact gcttctatta ttgccgcagc 480
aatctcgatt attgtgactt tactgattgc acgatcaatc acgaagccga ttggtgaaat 540
gcgcgagcaa gccattcgaa tcgctcgtgg tgattacgct ggaaaagtag aagtccatgg 600
aaaagatgaa ttaggccaat tagcagaaac atttaataca ttatcagaac ggattgaaga 660
agcacaagaa acaatggaag cagaaag 687

<210> 374
<211> 534
<212> DNA
<213> Enterococcus faecalis

<400> 374
tatcttagct tcgcaaccag ttactcgttt taggaatgct tttttcaatg aaacggaaga 60
tatccaaacc aatgaagaca gtcaagactt aacctacag agtaaagaag aacgattggt 120
tgcagaagaa aaactgggaa aaattgattt taaagggacc ttgccagaag agaataaacg 180
ggactcaatc tataatcaaa gcttttctta tgtaaaacgt ttaggaacca atatggggaa 240
tttgcgttac tttgatcgaa cgaaagatag tgtcaattat cggacttttg tggaaggttt 300
cccagtgttc agtaatgatt taaaaggcca agtggatatt cgcacacga acaacgatgg 360

tgctgcacca agcgtaacca ttaacacaag tgtgaatacg atccaagtgc cgattccttc 420
agaagaagaa gtgacgctgg aaagcacgga aaaattgatt aagcgtttag aaacggctgg 480
tgctaaaaag gaaaaaattc aatcggtgtg tatcggttat acgtggcaga caat 534

<210> 375
<211> 547
<212> DNA
<213> *Enterococcus faecalis*

<400> 375
gagcaacgtc tcttcttcca gccaaacaga atcgattgaa agtcggttgg aaaaagataa 60
catctcgtat aaagggacac tttcttcaga acgattggaa ggttattatt taagtggcga 120
acaaccaat ttttctgctg ctttaaaaat ccaacgtgaa agaataaaa attttttgag 180
aaatgggctg caaattgcgg ataatacttt aacgagtgtg cctagtataa actattttat 240
tgatcctaag aaaattgata aagatttaag taccttttta aatgaaaaaa atgctttatt 300
attcggagac gaatatcaat acttaccaga attttctcat ttaaaagagc cgacggcaga 360
aattgtggct gcacaatcgt ataaaggaat tccttttaga gacgacacgg caaaattaag 420
tatttttagca gattcgtcag gtgaattatg gcaaattagt aaatattcgc aaacgcacat 480
tgaaaaatatt gaagagttac gagacaaaac ggatttatat tccaatcgtg atgcgataga 540
cacgctc 547

<210> 376
<211> 224
<212> DNA
<213> *Enterococcus faecalis*

<400> 376
ttcatcgcaa taatcgttcc tttgttggtc taacggatac aggttattgt agcgatcata 60
ttcgtggtac gattgaaaat gcagatgctt atttagtoga aagcaatcat gaaattgaaa 120
ttttgcgagc aggaccttat ccatggagtc ttaacaacg gattttagga gataaaggcc 180
atztatccaa tgatgatggt gctcttgtga tggcggtatg gtta 224

<210> 377
<211> 500
<212> DNA
<213> *Enterococcus faecium*

<400> 377

tcttcatttg ttgaatatgc tgttttaagt attcgatgcg atattcatca tgtatgtttt 60
tatcatctgt caaaacatct atggcaccta atccattttc tgtaattatg ataggagtc 120
catattttct ataagtgtaa ttcagcagat accgtaaacc cgtcggatca atgggtccatc 180
cccatttact agtcacaaga tacgggtttt gaagaccgcc aaataaggca ctcttttctt 240
cagctgctcc ttcgtacttc gcaacagatg atgcataata gttcatacca ataaaatcaa 300
gtgttccttt agagaacata tatttatcat tctctgttat ggtcaacttt attccttggt 360
ctgcatatcc attgatttta tagtctggaa actttcctgt gcacatagca tctatttgat 420
agaaatctcg atccatttgt ttaaaagcat tcatcacatt tgttgatttg caatctactg 480
gataaacagg ttcgattcca 500

<210> 378
<211> 665
<212> DNA
<213> Enterococcus faecium

<400> 378
attattgtcg cctctttccg ctacgcgatt aacatgaatc atcaaataag tgtattcatc 60
ttgagataaa taggtgttga actttccttt tacatatatt tctatctttt ctacagctgt 120
atatgcttta gggatatagt tttttacttg ttcaaataac tgagattcat tttcaacgta 180
tgcttgtttt tttcttaatc gttcaataaa atactgtaaa tgtgtcacta gcctcatgta 240
gttgatgctc tcttcgtcaa tagataaact aaaatgatat ttgatgatat tcaacatgct 300
tcttagtgtc tccatatctt ctatctgttc atcaaaattg acctgatttt cttgaagatt 360
aacaaagtgt aaggcaattg aaacagcttc atctgtggga aaggaaatgat taaaatattt 420
cttcatcatt tttaaagctt ccaaaccgat tttgtaataa actggataaa actttttaac 480
ttccaaaaag agcggacttc taagatatgt tcctttttct gagcgtttca atgcaaagga 540
gagatgatct aataaagcta aataaagata atcatttgct tttttaccga tttccttttc 600
tccataacta acgagctcgt tgatcataga gatcagtcta tcatcagaat gcgataacaa 660
atagc 665

<210> 379
<211> 504
<212> DNA
<213> Enterococcus faecium

<400> 379

ctcctgatcc tcttcttggtg cagggacgcc taagagataa gcagctacag ctgatccagc 60
 aaaactaatc acgactgccg ctaacataaa ccagaagttc atgaaatctc cttcacctat 120
 atacgctggg aggccaaata aacccaagc aacagaataa gctttaacac tagtcaaacc 180
 agcaaataat ccaccaagtc ctcctccaat cattactgca acaaatggtc gacgatattt 240
 aacaaagaca ccatagatag cagggttcagt cacaccaagt actgcagaaa gtgttactgt 300
 cccaaataat tgtttttggtt ttaaattccg tgttcttaag aaatacccaa gcattgctcc 360
 cccaacagca atatctgaga ttgtacatga agatataaat gcagggtcat acccatttgc 420
 tgcaattaga gaagctacaa ccggcatgat aaagtttcc tgcgccaaca ttataataaa 480
 tggttgaaga gcagagtata acat 504

<210> 380
 <211> 555
 <212> DNA
 <213> Enterococcus faecium

<400> 380
 cggatgaagg aagtaaagaa aagttgtcag tcgtggctac caattcgatc ttggcggaca 60
 tggcaaaaga agtaggtaca atagatatcc acagtatccc gttcggaaaca gatccgcatg 120
 aatatgaacc attaccagaa gacatcaaaa aggcaagtgg tgcagatggt atttatataca 180
 acggtttgaa tcttgaaaca ggtaacagct ggttcgataa cttgatggaa acggctaaaa 240
 aagaaggga agattatatt gcagttagca aaaatgtaga acctctatat ttaactagcg 300
 gtgaagaaca tacaaaagca gatccccacg catggctaga cctatctaac ggaataaaat 360
 atgtggagga aatcgcacgt atattctctg aaaaagatgc agaaaatgcg aactctata 420
 aaaaaaatgc agaagcatat gtggaaaaac taaaagaatt agatacccca gccaaggga 480
 cttttgcttc tatcgaagag aacaaaaaat tattagtaac aagtgaaact gctttcaagt 540
 atttacgagc atatg 555

<210> 381
 <211> 401
 <212> DNA
 <213> Enterococcus faecium

<400> 381
 aaagcgattt gttgctgaca gcactcggtta gtggaatcgt cttgatattt gtctttttct 60
 ttataaaga attgaagatc acatcttttg atccgacaat ggcaaaggct ttttggtga 120

acacttggtt gatccattat cttttgatgt tctttttgac attagtggct gtagtcagtt 180
 tacagacagt aggaacaatc ttggtgattg ccatgttgat cacaccagcc gccacggctt 240
 acttgctaac gaaccattta ctgaaaatga tcattacagc tgcaggaatc ggtatgctaa 300
 gtgcagttgt cgggtgtgtt ttccagtatag ttacattggc catcagagct acgatcgtgt 360
 tagcatgtac cgcatttttt atccttgcta atttaatttt c 401

<210> 382
 <211> 507
 <212> DNA
 <213> Enterococcus faecium

<400> 382
 agccggtaaa ctacgtccgt aaaaaaatag cctacgtgga acaacgaagt gaattggatc 60
 tttcctttcc agtcatggta ataggcgttg tacttttagg aacatatcca tctttacgaa 120
 ttggacaaag acctgggaaa cctggaaaag aacgtgcaag acaagctttg aaaaaagtag 180
 ggttggaga atatgcaaaa agacagatca gcgaactatc ggggtggacag ctccagagag 240
 tttttattgc aagagctcta gcccaaggag cagaatggat ctttttagat gaaccattcg 300
 tagggattga tgcgttaagt gaacgaaaga tctttgacat cttgcaggaa ttgaagaatt 360
 caggaaaaac gatattgatc gtccatcatt ttcttcataa agtagacgaa tatttcgatg 420
 aggttattct tgtaataaaa cagctgatcg cttccgggtcc agtacaagag tcttttacat 480
 cagaagacct tcaattgcct tatgggtg 507

<210> 383
 <211> 456
 <212> DNA
 <213> Enterococcus faecium

<400> 383
 attactcgtt tcccctgaca gttggcagga catgctgatc gtagacaagg tttctaaaga 60
 cggtatcgaa gcaaatatgg cagtcatgtc gcaaaaagga ttgattggcc gaggatcgga 120
 ggtcaatacg gcttcgtcta aaatcgaatt actgtcatcc tctaataaaa gctccaatca 180
 ttttcagta cgggtatctt cggctaattg cgaagcgttt gggttgctta aaaactatga 240
 tgaaaagctc catgccttag tggtgaccca attaactggt gatacggata tcaaagaagg 300
 ggatgttgtc cagacatccg gtcttgaggg gaattctcca gctaacttgc cgatcgggtac 360
 ggattataaa acgaaaccag atagttatgg gctggatcgg gaagtttatg tgaaacctta 420

tgacagaaatg tatgacgtgt cagttgtgac gattgt

456

<210> 384

<211> 500

<212> DNA

<213> Enterococcus faecium

<400> 384

atgttgaaga aagaaacaat gaagtactat ctgccaatcg ttttgttctt tttgatgttg 60

atagatggtc atttaacaag aatgctaggg gagtggtcga aaggcaccta tatgtcaaat 120

gccactttc tgatattggc attattatgt tgcagtatgg cgtttgaaaa acgttattta 180

ctgattacca cgattgttct cggggctatc tatgacgctt actatattgg cgttatcggt 240

atctatgcag tagctctccc ttaattgta tggttgatgt atgtaatgaa agacgttata 300

catgtcaaca tctttactga atttttcagt atgatcatct ttgtcacggg ttatgaattg 360

tttacgatgg tgggccagtt gatttttaaa ttagcagtag taaataacac gtattttatt 420

acaaggtttt taggacctac actgctgttg aacatgatta tatttgtatt attcattttt 480

ccctttaaga aattattcag 500

<210> 385

<211> 507

<212> DNA

<213> Enterococcus faecium

<400> 385

tcagtcagtt tcttgacctt tttcgtaaag aagccggcct ctactaaaa gcttcagtaa 60

tcagtcagaa tttcgttcct accgcagctg gattagcctc ctctgccagc gggctagctg 120

ctttagcagg agcttgcaat actgctctta agcttggatt agacgatctc tctctttcaa 180

gatttgctcg acgcgggtct gggtcagctt gccgaagtat tttcggtggt ttcgtcgaat 240

gggaaaaagg ccatgacgac ttaagttctt acgctaagcc agtcccttcc gattctttcg 300

aagacgattt agcaatggtt ttcgttttga tcaacgacca gaaaaaagaa gtgtccagca 360

gaaatgggat gcgtcggaca gtcgaaacat ccaattttta tcaaggctgg ttagattccg 420

ttgaagggga tctatatcaa ttgaaacaag caatcaaaac aaaagatttc caacttctcg 480

gagaaacgat ggaaagaaac ggactaa 507

<210> 386

<211> 508

<212> DNA

<213> Enterococcus faecium

<400> 386

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ccaattaggt gaagcagaac ttgtgatagc cggcgggaaca gagagtatgt ctcaagcacc      60
tatgctgaaa ccgtatcagt cagaaaacaaa tgaatatggg gaaccaatth ccagtatggg      120
caacgacgga ttgactgacg cattttcaaa tgcacatatg ggattaaccg cagagaaggt      180
tgcaacacaa ttttctgtga gcagagaaga acaggatcgc tatgccttgt cgtcccagtt      240
gaaagcagca catgctgtcg aagccggtgt attttctgag gagatcatcc cagtcaagat      300
ttctgatgaa gacgtgttat ctgaggatga agcagttcgt ggaaatagta cattggaaaa      360
actgggcacg ttacgtacag tatttctcaga agaaggaact gtaacagcag gaaatgcttc      420
cccgttgaat gacggtgcct ctgtggtgat ccttgcaccc aaagaatacg cagaaaataa      480
taatctgcct tatttagcaa ccatcaaa      508
```

<210> 387

<211> 501

<212> DNA

<213> Enterococcus faecium

<400> 387

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gattgccttt cttttctatg caacaaaagt caccgcattc cttgaagagc tggatgcaat      60
ggacgatcaa ctggtttctt cctactatcc aggaatttta gccgaagctc ctcatgcatt      120
aaaaaatatc aaaaaattat tcattcactt aaaaaaacag catgacatcc aaaaaaactt      180
gcaactgacc attgaaagca cgattcctgc tgaacgtgga atgggatcaa gcgctgcagt      240
cgccacagca gtcactcgtg ctttttatga ttacttagca tttcctttgt ctctgtgaaat      300
actattagaa aatgtccagc tttcggaaaa aatcgccac ggtaatccta gtggaatcga      360
tgacgccgct actagcagct tgcagccgat ttattttaca aaagggcatc ctttcgacta      420
ctttcttttg aacatcgatg cttttttgat tgtcgtgat acaggaatca aaggacaaac      480
aagagaagcc gtcaaagatg t      501
```

<210> 388

<211> 505

<212> DNA

<213> Enterococcus faecium

<400> 388

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caagaacaag aaactcagca ttctatcagt gagttacttg ccctggattg gccagggtcta      60
tccattgagc cattgattgc tcctgaagat ttacgtttat tgattggttg gacgggtagc      120
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cctgcctcta cttctgattt ggtcgatcaa gttcacggtt cgagagaaga taaaatggtg 180
gcttatcagc ttttcttaaa aaacagtaca gaatgtgtca atgaaatgat caaagggttt 240
aaagaaaata atgtaacggtt gattcaacag atgattcgaa aaaaccgaca attactgcat 300
gatttatctg caatcactgg ggtcgtcatc gaaacgcctg ctttgaacaa attgtgtaat 360
ttagctgaac agtatgaagg agccgcaaaa tcttctggtg caggtggggg cgattgcgga 420
atcgtaattg ttgaccagaa atctggcatt cttcctttta tgagtgcatt ggaaaaagca 480
gaaatcactc cactgccgtt acatg 505

<210> 389
<211> 585
<212> DNA
<213> Enterococcus faecium

<400> 389
aaattcactt actgcaccag agccgtagct gaatagaccg atgcgatctc ctggctgtag 60
tgatttcgaa ttttccagta gagaagtttag cccaggtat aatgaaccag tgtaaagatt 120
accgattcgt cggctgtaac ggatgctttc ttcatagcga gccataagac gttcctgatt 180
atcttcgtct gtttggctta atacgctttg caatgccttt tttcccatct tagtatacgg 240
aatatggaaa gcaatgcctt gataatcttc gagtctctga cccgacaatt ctttatgtcg 300
attccaaact ttttggatg attcgatata cgtagaatta gataaaggac catcaacaac 360
aggaaattcg ctataatctg gacgccagaa atcatagata tcttctgtca gaaatacgtc 420
gtcgtcttca atcgataaaa tacgcgggtt ttgagtgtc atcatcgcaa cagcaccgac 480
accttgcgtc acttcaccac cgcttgccaa gccgtaacga gcaatatcac ttgctatgac 540
tagtactttt cgttctggat gatttttgac atattctttc gccat 585

<210> 390
<211> 300
<212> DNA
<213> Enterococcus faecium

<400> 390
gcatatttcg cttgatatat aggttcatac gtggtggaac aacgtatgat gttttaggaa 60
atagttgtga taaatcacgt ggtctactca catttgtaat atcataccgc ttttttgctt 120
caggagaaga agctctaata tcaatcctaa accagtattg tcagcgcgac tcataacaac 180
aagttctgtt gttaatggat caaaatttct ttctatacac tcgatactcg cataaaaagg 240

cttcatgtcg attagaaaat aatcattttac tgattctttc gaataatcca gcatgaataa 300

<210> 391
 <211> 273
 <212> DNA
 <213> Enterococcus faecium

<400> 391
 atatttcac ccagctctt tttttactaa tataccaact acatttaata acaaaataac 60
 tagtaaaact aatattttta gtggcataga atattcaaaa ataaataaag gcaccataca 120
 tgtagctatc aatataaata cagaacttac gtattttatt attttacgga acattataac 180
 ctattacaac tccgcaaata gccatagccc ataccataga taagattttt accagcacca 240
 ccaccacatg tttgttttat ctctttcata ctt 273

<210> 392
 <211> 626
 <212> DNA
 <213> Enterococcus faecium

<400> 392
 agcagttccg gtatctcttt ttttctcaga atattatttc tatgtgcttt gttacaatcc 60
 attttctttc aaaaaatagc atcatttata atatggttct ccgtatcgcg agcgaatggt 120
 attggcta atctctggcaa acaagtgttc accacaaaat tcctaactaa acaaaaaata 180
 gcataaatta atgctcttag tcacagatca tactgtaaca gtatgatctt attttctgac 240
 aaaataagaa taccaatcat ttatggtacg acattctaag cgtaa atgat tgatattctt 300
 ttgcagaaac attcttaatt tgtacctaaa gattgctgac taaaaa atag atagaaaatt 360
 ttcttcactc tatttaatac gttgcttgaa gttttatagt tatctattaa cattctcgtc 420
 ccctattgtc ggggataggt ttcgattaga tgaactcgaa aacgttgcta tatcaattat 480
 ggaaacatta ttctctgtcc agtgatggga caatccatac tcttccaatt agttatttgg 540
 tcgattcacg ggaaaaattt tatatgcagt tcattattac tactcatctt cagactgtac 600
 cgattcaaaa cattaccctt ttttca 626

<210> 393
 <211> 508
 <212> DNA
 <213> Enterococcus faecium

<400> 393

tgaagtcctt tgtctttgtt gcttagtacg ctcgggattt cttctttttg tcaaggatga 60
 aaatgatttt tcaaaggatt ttggattttc attgtatcta ttatccaaaa tgttttgaat 120
 gtttaacact aatgtcataa ctaataatgg cttattgcta gcgtctatcg aagtattttt 180
 tatttccttc aatatcaatg tcatagagat agacatttaa aatctgcgac attttcaccg 240
 ggatttagcc catctttttc gtcaattttt ggattctttt ttagtttcta ttggaaagaa 300
 tcttcaactg acataattca ttttgtattt ttatctgtcc tcttaacatt ttagtgtcaa 360
 ttttaaatagt gcttcacacg agaaaggat aaacatacca ataaatttgg tatgactaat 420
 gaaccttgca ctgcatagta tagccatacg cggatatact atatctctta tgttccttag 480
 agtaaaacct ctaaactcggg gtgtattg 508

<210> 394
 <211> 321
 <212> DNA
 <213> Enterococcus faecium

<400> 394
 tctattaaac agacacaact tatctatggg ggtaccactc atagtggaaa atattatgga 60
 aatggagtgt attgcactaa aaataaatgt acggtcgatt gggccaaggc aactacttgt 120
 attgcaggaa tgtctatagg tggtttttta ggtggagcaa ttccaggga gtgctaaaat 180
 gaaaaaaaaat gctaagcaaa ttgttcatga attatataat gatatatcta taagtaaaga 240
 tcttaaatat tctgatattc ttgaggtttt acaaaaggta tatttaaat tagaaaaaca 300
 aaaatatgaa ttagatcccg g 321

<210> 395
 <211> 613
 <212> DNA
 <213> Enterococcus faecium

<400> 395
 ttcataagga cgatgtgttg gttagattgg attgttcttt aatagagaat gaaaaggctc 60
 agatagaaca agaaaaccaa cgtattactc aacaaataaa gatggctcag ctatttattg 120
 aaagtataag taaaggaaaa aatttgtttt caacggatga cagttttggc tacagtaatc 180
 aattaaagag catgttgtca gaaaaagaat cactccgcta cgctttgaag caaagtgaat 240
 taaatgatca aaagcaatta gaagtatacg aaaagacaaa aagacaacta gaaaaacaaa 300
 ttgagagttc agatagtaaa ttacaagaat ggcaacaagt acaggtagct tggagtaata 360

atcaatcatt aaaagatttt tcaaaagaaa tgatggcaaa ctatgagaat tggcaagaac 420
aactaaataa tgtttctgat gatcaaaaa atcaagtga actgacaatt tcagcaagca 480
taaatagaaca aattgagcaa ctaaaaaaag aagtagaaca gtatcagtca gaaaaagcta 540
aattagttaa accaactact tctgagaatg acagaattag tcaaacggaa aaaggaaagc 600
aagagctaga aca 613

<210> 396
<211> 400
<212> DNA
<213> Enterococcus faecium

<400> 396
attatgtgaa gatcaaatta tacaattaaa tcagttagaa cgaattattg ataatttcat 60
tctttttcac gataaagtat ttaagatagt attgaaaaca caaagtccgt tagaagttaa 120
aaaatacctc aaacaattcc gaccaaagca aggaatatat ttcttagata ttgatttaaa 180
tcatgaagtt aacggtatag aattagcaga agtaatcaga aaatatgatg ttcaagcaaa 240
aatcatTTTT acaactactc atgatgagat gttaccgta acaataaaaa gaagagttga 300
aacgtagga tttgtaacaa aagatcaaac actagatgag tatcgaaacg agattgttga 360
gttattgtta ttagcgcaag aaaggataga tgcaacaaaa 400

<210> 397
<211> 533
<212> DNA
<213> Enterococcus faecium

<400> 397
atcttgatct tgccattcca tttttcttt accgaaaaga ttagcttttc tagtcaagta 60
attaacaagg gggtgttgt ttttctggat tgtatccac atgacagaca atgtttcttt 120
cttcaaccga ttgtactcta atggtttttg tagaaaatct gtgacaccat gaagttcata 180
gtcagaaagt ctaaaacat ctaaatgatt caaagtatcc gtgaagagg gtgccttttc 240
ttccaggct tcttcccatg ctgcgaaaag tgtttctctg acttttggat ctggatcgcc 300
catcatctta ttgaaggctt gtccagcaga taattcgact actgttccat cttgttcgaa 360
gggaatcgaa atgctggcta caatcgtatc ataatgactg ctccaagcat ttagaccatc 420
taaagaaagc gtatttataa tgttttcttc agcttctgat aataattgtg agccatcacg 480
acgaatctcg tttaaacgaa aagcaattgt ttcaaacgaa gattgagaaa gca 533

<210> 398
 <211> 171
 <212> DNA
 <213> *Enterococcus faecium*

<400> 398
 tgaatcttca gcaacagaag aatcaacaac agtgcctgaa tcttcaacaa cagaagaatc 60
 aacaacacct ggcctacaa caccatcaac agatcaaagt gttgatacag gaaacggcac 120
 aggaagtagt actccggctc caacgccaac accaacacct gaacaaccaa a 171

<210> 399
 <211> 519
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 399
 aggatcattt gtctcctacg gcccgactg ggccaacgtc agcaacgccc cctacgcca 60
 ttatcacaaa accaccagcg cccagggcgg catcaatacc gactttatga tctccggtcc 120
 cgggatcacc cgccacggta aaatcgacgc ctcgacgatg gcggtgtatg acgtggcgcc 180
 gacgctatat gaattcgccg gcatcgatcc gaacaagtgc ctggcgaaaa agccggtggt 240
 gccgatgatc ggcgtcagct ttaagcgcta tctcaccggc gaagtacagg agccgccgcg 300
 cggcaactac ggggttgaac tgcacatca ggcggcctgg gtcgatggcg aatggaagct 360
 gcgacggctg gtgcccgcgc gcctcaccgc cggcgacgcg ccgtggcagc tgtttaatct 420
 gcacgacgac ccgctggaga cgcgatgatg cgcggccgaa catcccgatc ggggtcaaagc 480
 catgagcgag gcctacgagg catttgctaa ggcacccat 519

<210> 400
 <211> 320
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 400
 ctgatcaacg acgcatggtg ccgactgttc cggaacatg gctttattat cgggttgagc 60
 ctgaaggca acgaagcgct gcaggactac catcgtccgg ataaacgcgg ccggtcgacc 120
 tggtcggcag cgctgcgcgg cattgacctg ctccatcagc atcaagtggg ctttaatctg 180
 ctggtggtgg tgcataacga gatggcggcc cagcggcggc cgatttatga ccggctggtc 240
 agcctcgcg cgcgctatct gcagtttcag ccgctgatga gcgaaggcgc ggccctgcgc 300
 gaaggatacc agctcagcgc 320

<210> 401
<211> 201
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 401
ccgatcagagt ccattacccc ggagattgtc gacaaagtct acaacatcaa cgtcaaaggg 60
gtgatctggg gcatccaggc ggcggtcgag gcctttaaga aagagggtca cggcgggaaa 120
atcatcaacg cctgttccca ggccggccac gtcggtaacc cggagctggc ggtgtatagc 180
tcgagtaaatt tcgccgtacg c 201

<210> 402
<211> 305
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 402
gcctgcttcg ttgatagatt acctaccgcc ctttcgcaca acgaatggat ctcgatcgtg 60
gggaatctac ttgataacgc ctacaatgcc agcctgcgtc aaccgcaggg ttcaaaacag 120
atcgaatgcc tgatcaacag tgatggccag gaggtgatca ttgagatcgc cgaccaggga 180
tgcggcattg acgaggcgct gcgcgatcgg atcttcgagc gcggcgtcac cagcagcgcc 240
agcaaagatc atggtatcgg actctggcta gtacgcagct acgtggaaca agcaggcggc 300
agtat 305

<210> 403
<211> 608
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 403
gccaccttta ttccttcgcg gctggtccac tatggtctgc tgectgacgt ggttattgaa 60
tccacgacca aattctataa atccaactaac atcctctatc tctatatctg ctgcatcatt 120
gtcggcagca tcatgagtat gaaccgcacc acgctgattc agggctttct gaagatcttc 180
ttcccgatgc tgtgcggcga agtggtcggc atgctggtgg gcatcggcgt cggcacgctg 240
ctgggcatgg agccgttcca ggtgttcttc tttatcgtgc tgccgattat ggccggcggc 300
gtgggagagg gggcgatccc gctgtcaatg ggttatgccg cgctgatgca tatggagcag 360
ggcgtggccc tgggccgggt attgccgatg gtgatgcttg gcagcctgac ggcgatcgtc 420

atctccggct gcctcaacca gctcggcaag cgcttcccg c atctgaccgg cgaagggcaa 480
 ctgatgccga accgcagcca tgaaaccgc agcctcagcg agagcgaagg cgtgagcggc 540
 aagaccgacg ttgggaccct cgcctccggc gcgctgctgg cggctactgct gtatatgatg 600
 gggatgct 608

<210> 404
 <211> 490
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 404
 gtcagcatcg aggcattgct ggcggcgaaa gagcagcgtg cagcccgcca ggccgactgg 60
 ttggccatt atcagcagcc tgattattcc ctgaccctgg tgacccggg ggcgggtaag 120
 gacagcattc gctatcgtaa tatgatgggc gttgccctcc aggcctgcga tcagctgctg 180
 tggaagcacc gctggcaaac gctggatcgt cagggtctat ggctgccgac cgggccagaa 240
 gcgctgtggt gcgtagcgca tccggccagc gaaatcaaag cgatgtgcag tacgctggag 300
 cagatccatc cgctgggacg cctgtgggat atcgatgtaa tctgtccgca gaacgggctg 360
 gtgggacgcc agtcgctggg cgaatcgag cgccgctgcc tgctgtgcga tgagccggcg 420
 cagcctgtg cgcgacggc tcgtcacgac accgatctcg tcgtcgcccg cgttgagcag 480
 atgattgacg 490

<210> 405
 <211> 509
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 405
 gttgttctcc actaccact ggataaaggc ctccccatc accggcgctt tgtcatcaat 60
 tccggcttgc gctttgatgc gggccggcag atcggccgcc ggacgcgggg tgatgcggtc 120
 caccatggtg ttcgacagc tggattggc cgccatccag tcaatcaccg cctgtttgcc 180
 ggtgagctgc aggaactcga ccataccgtc gtggaaacgc tcgccgttat ggcgcacgtt 240
 atcgcagttg agcagggtca gcggccggc gttgtcggcc atgcgctttt ccaggatccg 300
 cgcgagggtg ccgtaaatgg ttttgactc gccttgacg tcggcctgca gatcggggtt 360
 gctggtttcc agccgatggc gagtggtcag gtagtacctt ccttccgtca cggtaaaggc 420
 gataactttg gtctgcgggt ttgccccttc gttaatcagc ggctgtagcc cggcctgcca 480

cggtagcagt ttctggattg aggtgatct

509

<210> 406

<211> 533

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 406

gacttccggt ttttcacaca ccgcggcaat gggtttgccc gccgccaggc aggccagccg 60

cgccgcgccc agcgcgcgcg cggtctctcc gcctttgtgg gtcaccaccg gcatagcgag 120

aatatcggcc agcagctggg ccagaaacgg gctgcgggcg ccccgccca ccagcgagca 180

ctgcgcgata ggcgtcccgc tctctttcaa tgctgcagg ccgtcgttga tcccaaagct 240

cacccctcc agcaccgcgt agccgagctg cgcgcgcagg ctggcgtggg tcatgcccc 300

gaagatgccg cgcgcgtcag gatcggtatg cggggttcgt tccccggaga gatagggcag 360

gaagaacggc gcgttggtt tctctctc gcttagctcg gcaatctccg ccagcagcgc 420

cacctccgtg gtgccggtca agcggcagaa ccaactgaaa cagctggcgg cgctcagcat 480

gacgtcatc tgggtgccaca gggtcggcag cacgtgacaa aacgcatgta ccg 533

<210> 407

<211> 260

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 407

ccagctcggg aaacttctca cgggtggtga gattctgcat atgctgcggc gtttgaatat 60

ggcgcaggga aaccagggca atcacgcccc cggtaaggca gaaggccagc gccagccaca 120

gggtgcccac ttccccaatg tgaggaaatg taaagctcgg aatatagctg ccgaagaccc 180

cgatgccgat ggaatacacc gcccagaacc agccgatggc cgagctggcg ttgtcgcttt 240

tgacgttatg gacaatcgcc 260

<210> 408

<211> 501

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 408

taacggcaaa gacgctaaaa accggcaacg tcggtgtctc ttttacgggc gatggtggtt 60

ctaatacagg cctgggtctt gaagccatca atatggccgt cgtgctccag cttccagccg 120

tctttatttt cgagaataac ggttacggcg aaggaaccgg ccatgactac gccgtgggtg 180

ggcgtgatat cgcccggcgc gccgctggct tcggcctgcc ggcagtgacc gtcgatggca 240
 ccgatttctt tgccgtttat gaggcaacct cagaggcggc caagcgtgcg cgagaaggcg 300
 gtggcccaag cgtcattgag gccaaagcct tccgctggca tggtcatttt gagggcgatc 360
 ccgcgctata tcgtgcggaa ggtgaagtgc aacgcctgcg tgaacaacat gatccgctga 420
 agattttcac cgctaaggtc aagcaacata tcaccagga agaactggcg gcgattgacg 480
 aggaagtaga agccctggtc a 501

<210> 409
 <211> 535
 <212> DNA
 <213> Klebsiella pneumoniae

<400> 409
 cctataatat ctttgccacc acgcctggac tgaaggtggt ggtgccctcg acgccttatg 60
 acgtcaaggg tctgttaatc cagtccattc gcgacgacga cccggtggta ttctgcgagc 120
 ataaaatgct gtacgacctc aagggcgagg taccggacga gatctatacc atcccgctag 180
 gtgtagccaa ctacactcgc gaaggggagg acgtcaccat cattgcgttg tcggcaatgg 240
 tacataaagc aaaccagggtg gcggacaaac tggccagaga ggggatctcg gtcgaggtgg 300
 tcgacccgcg aaccatttcg ccgctggatg aggaaggtat tctggaatcg gtggcgtcca 360
 cggggcgggc cgtgattgtc gacgaatccg ctgcacgctt cggttttgct catgatgtcg 420
 cggcgctgat tgcgtcccag gcattccatt tctcaaagc gcccgttctg ctggtgacgc 480
 cgccacacac gccggtcccg ttctcccctg ctctcgaaaa actctggatc cctgg 535

<210> 410
 <211> 543
 <212> DNA
 <213> Klebsiella pneumoniae

<400> 410
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 cgtcaatgtg ctggaggccc cttttgccg tacgttacgt cggatactcg cccgcgaggg 180
 tgagacgctt caggtaggcg ccgtgctggc cctggcggtg gacgcgtcgg tcagcgatgc 240
 tgaactggac gaatttggtg cccgcctggc gacggcgaaa cccgcagccc caggcccggg 300
 ggctgccgcg ccggacgtag cggcacaggc aggcgctaag ccagcttccg ttgtttcgcc 360

gccatccaac agccccgagc cccctgttgg gcagaccgtc atccccgtca gtctgcaagg 420
 tgtgaccgat gtgactcagg ttaatgccac gcccacatgcg ttacgactgt ctgcccgtg 480
 ggggtgtcgac ctgaaaaaag tcgcggcagc gggcgcgggg atcgtatctc tgtttctgat 540
 ctg 543

<210> 411
 <211> 596
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 411
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 cattatgaga tccctgtccc ctggtttctg ctgaccatc cggtatgggtt tacgctgatt 120
 gacggcggtc tggctgtcga aggattgaaa gatcccagcg gttattgggg aagtactgta 180
 gagcagttta aaccggtgat gtcagaagaa cagggttgcg tggaacaact taagaggatt 240
 ggcattgctc ctgaggatat ccgctatgtg gtcctgtccc atttgactc tgatcatacg 300
 ggagcaattg gtgccttccc ccatgtacg catgttgctc agaggcaaga gtatgaatat 360
 gcctttgccc ctgactgggt tacttcggga gcctattgcc gacgcgattt cgatcgtccc 420
 caacttaact ggctatttct gaacgggttg tccgatgatc actatgacct ttacggtgat 480
 ggcacgttac aatgtatttt caccacaggc cattcaccgg gccatcaatc ttttcttatac 540
 cgcttaccgg gtggtacaaa ttttacgcta gcgattgatg cggcttatac cttaga 596

<210> 412
 <211> 693
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 412
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 tatcagggtga gtcacccgga tcgtctgcgc aacgtccata ctgccccgc cgatctgtcc 120
 tgccgaggagc tggcccatcg gctggagaat gcgccgcggc ttgagcggct tgccggcgaa 180
 gccgccctga tccacggaaa acgggtcgtc gggttgaccc acgccgagct caaggtgatc 240
 ctccgccctgc tgcaagggca gacgataggc gagcaggccc aacgtctcgg attgagccag 300
 aaaaagctct acaccacagc gctggctggg gtgaaaaagc tgggtggaatg tcatccgcat 360
 ctggcccccc gctttccgcg cacgctgctg ccgcgctcac ccgcaaagc actgacggcg 420

tttgaacagg aatgggtaca agcgattcac gatcgccagg tcttcccgt ttttcaacct 480
 atcgctcgata gtcgctcaca gctacagggg gtggagatcc tgatccgctg gcgccaccgc 540
 ggcaggtac ttcaccccca gacctttctg ccgcacttcc gcgccgacta cacctggctg 600
 ctgcttacgg cctttgttct gcaggaggcc gtgcagaata ttaatgagta tccaggcacc 660
 ttctatTTTT cggTcaacat accctcctca etc 693

<210> 413
 <211> 514
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 413
 ccgatcatga gaacatcagt attgaactgc agcgtgagtt ccttcctgag gaacgtgaag 60
 attacgctca tgtcttctat agcggccctc ttgacgctt ctattcgtac cagtacggtc 120
 ggtaggcta ccgcactctg gatttcgaaa aatttaccta tcaaggtagc tatcaggggt 180
 gcgctgtgat gaattattgc tccatcgatg tgccatatac acgcatcact gagcataagt 240
 atttttctcc atgggaaagc catgaagggt cggctctgcta taaagaatac agtcgcgctt 300
 gcggcgagaa tgatattcct tattacccca ttgcacagat gggggagatg gctttactgg 360
 aaaaatatct ttctcttgcc gaaagtgaag aaaatattac cttcgtcggg cggtaggta 420
 cctatcggtg tcttgatagc gatgtaacca ttgcggaagc gctgaaaaca gccgatgagt 480
 ttttatcttc ggtggctaac caggaagaga tgcc 514

<210> 414
 <211> 584
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 414
 agagatgggc tgcaaactgc tgcagcgtac caccgcaag ctgcgtctta gcgatgccgg 60
 ggaaacgata tatcagcatg ccagcagat gctggaagcg gcgcgacagg caatggattc 120
 cgcaggcagt cgccaaacgg tcgcccaggg aaagctgacg ctaagcgctc cgaaagccgt 180
 cggccgcttt gtgatccacc cgctgatgat ggcgtttttc caccgctacc cgcagggtga 240
 cgtctgcctg cggctggaag atcgccctct cgattttatc gatgacggta ttgatctggc 300
 gctacgcac accgataccc cctccccggg cctgcatggc aaaccgctga tgccaatcag 360
 gcacgttatc tgcgccactg aggcctatct acagcagcac ggtacgccgt acacgccgca 420

ggatctgcgc gcgcatagct gcattagcct tggcgaaacg cccgccgatg cgcgctggaa 480
gttccgtcgg gaaggcaaaa cagaaacggt gcaaacctac gggcggtacg ccgccaacca 540
taccgccgta cgcctcgacg cggtcagaca gcatttaggg atcg 584

<210> 415
<211> 281
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 415
acagattaca ttgtcatttc ctgccagccg cgcctgagc ggccgagcgc tggcaggagt 60
cgtgggttca ggcgatatgg aagtacttta taccgccgca cagagcgcca cgctcaacgt 120
acagatcacc acctcagtgg ataacagcca ggcgcgctgg caggcgctgt tcgacaggtt 180
gaacctgac aacggcctgc ccgccgggca gttgattatc cagacttcg gcgccacgcc 240
gggcgctgcc cgtattcgta ttgaacagggt ttttgaggag g 281

<210> 416
<211> 656
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 416
atggattttg cttacccgc cagctgttt agcgcgacgg taaaaacgcc gtgggccggg 60
atcgtcgcgc agtcgccgct ggtgctggtg ttgaccggcg cgatgtggat cacctatgcc 120
gcgatctact tcctcgccac cagcgtgttc aaacgcacgc cgcaggatgc cgcggtgctg 180
acctcaccg tcgccctgcc aaactatgcc gcgttaggtc tgccgatcct cggcagcgtg 240
ctgggtgaag gcgcgtcaac ctactgtcg gtagcgggtc ctatcgctg cggctcggtg 300
ctgatgaccc cgttctgcct gctgattctg gagcgtgaaa aagcccgcgc cgcgggtgaa 360
aacagcgggt ctacgctggc aatgctgccg gtgctgatgt ggcgttcggt gaaaaaacgg 420
atcgtctggg gcccgctgct tggggtggtg ctttccgcga tcggcattaa aatgccggac 480
ctgctgctgg cgtcgatcaa accgctgggc ctggccgcca ccgccgccgc gctgttctc 540
accggggtga tcctgtcggc gcgtaaacgt cagctcaatg cgctgatcgc tacatcaacc 600
atcgtgaaac tgctggtgca gccgtttatt gcctggggtc tggatgatt acttgg 656

<210> 417
<211> 456

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 417

| | |
|---|-----|
| tatttacctt tcccggtcag ggcggccagc gtcccggcat gctggcgatg atccccgatc | 60 |
| gcgaggcgat cctcaccagc gcgcgcgcgc tgctggggga tgaagtcgat accctcgata | 120 |
| gcgccgatgc gctacaacac acccgtgcgc tccagctctg tctgctgac gccgggtgctg | 180 |
| cctgggcgcgc cgagctacag cgtcaggcgc tggatccgca gatggtcagc ggcctctcta | 240 |
| tcggcgcggt tccggccgcgc gtgattgcgc gcgcgcctga tttcgccagc gcgctgcgcgc | 300 |
| tggtagccct gcgcggggac ttaatggaac aggcgtatcc tgaaggttac ggactgacgc | 360 |
| cgattatggg cctgaccgcgc ccgcgggttg aggcgctgat gcagggcaac gaggtttatc | 420 |
| tcgccaatct gaacgccgaa acgcagttcg tgattg | 456 |

<210> 418

<211> 537

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 418

| | |
|--|-----|
| tgctgctgat accaatgtag gcggcggcca ggttaatttc ttcggtaaag ttaccgacgt | 60 |
| atcttgact gtttccgtaa acggccaggg cagcgatgcg aacgtttatc tgtcaccagt | 120 |
| gactttaacg gaagttaaag ctgccgcgcgc ggatacctat ctgaaaccga aatctttcac | 180 |
| catcgatggt tctgactgcc aggcgcctga tggcaccaaa caggatgatg tgagcaaact | 240 |
| gggtgtgaac tggaccgcgc gtaacctgct ggcgggcgca accgctaaac agcagggcta | 300 |
| cctggctaac accgaagccg ccgcgcgcgc gaatatccag ctggttctct ccaccgataa | 360 |
| cgccaccgcgc ctgaccaaca aaatcatccc gggcgacagc acccagccta aagcggccgc | 420 |
| tgatgcctct gccgttcagg atggcgcgcgc cttcacttac tacgtcggct atgcgaccag | 480 |
| caccccgacc acggttacca ccggtgtggt taacagctac gcgacttacg aaattac | 537 |

<210> 419

<211> 554

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 419

| | |
|---|-----|
| cgcaatacca taccttcacc gccacgatg ccgtggctta gcgcgaacag ttcgccgga | 60 |
| tcgacaaccc atctgagctg gtcagcgcgc aggaagtggg cgatggcaac ctcaatctgg | 120 |

tgttttaaagt gttcgatcgt cagggcgctca gccgggcgat cgtcaaacag gccctgccct 180
 acgtgcgctg cgtcggcgaa tcctggccgc tgaccctcga ccgcgcccggt ctccaagcgc 240
 agacctgggt cgccactat cagcacagcc cgcagcacac ggtaaaaatc catcactttg 300
 atcccagagct ggcggtgatg gtgatggaag atctttccga ccaccgcac c tggcgcgag 360
 agcttatcgc taacgtctac tatccccagg cggcccgcca gcttggcgac tatctggcgc 420
 aggtgttgtt ccacaccagc gatttctacc tccatcccca cgagaaaaag gcgcaggtgg 480
 cgcagtttat taaccggcg atgtgcgaga tcaccgagga tctgttcttt aacgaccggt 540
 atcagatcca cgag 554

<210> 420
 <211> 220
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 420
 gtgcgtttaa tctcctcaag ccagctcgcc agacgcgctt cggctctggc gaactggtta 60
 tcctgatcca gcaccagccc aacaaagcgg tcgccttcca gcgcgagga cgcgctgaat 120
 tcataaccct catttgcca gctgccaatc atctgcgcgc cgcgcgcgct cagggcgctc 180
 aacagcgggc gcatcccgct gacgaagttg tccggatagc 220

<210> 421
 <211> 341
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 421
 aaattgccga agtcaatct ggtgaccggc tttgaaacct atctcgcaa cttccgcgta 60
 ttaaagcgga tgatggaaca gatggcggtg ccgtgcagcc tgctctccga tccgtcggaa 120
 gttctcgaca cgcccgccga cggtcactat cggatgtatt ccggcggcac cacgcagcag 180
 gagatgaaag aggccctga cgccatcgat acgtgctcc tgcagccgtg gcagctgctg 240
 aagagcaaaa aagtggtgca ggagatgtgg aaccagcccg ccaccgaggt cgccattccg 300
 ctggggctgg ccgccaccga tgaactgctg atgaccgtca g 341

<210> 422
 <211> 400
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 422
 agagagcgtc attgagcagt ggggtgccgcc ggcgccgcgc ccggtccagc gcaatcgccg 60
 ggtcaatctg ctgggtcagcc atctctgttc gccgggcgat atcgagtggc tgcgccgatg 120
 cgtcgaagcc tttggtctgc agccgataat cctgccggac ctggcgcaat cgatggacgg 180
 ccacctggcg cagggcgatt tctcgccgct gaccagggc gggacgccgc tgcgccagat 240
 agagcagatg gggcaaagcc tgtgcagctt cgccattggc gtctcccttc atcgcgctc 300
 atcgctgctg gccccgcgct gccgcggcga ggttatcgcc ctgccgcacc tgatgacct 360
 cgaacgctgc gacgccttta ttcatcaact ggcgaaaatt 400

<210> 423
 <211> 536
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 423
 acaggggtga tcctcgtcga cattacgatg cgctttcctc ctggcgccag tttcataacc 60
 ttcacccatg ccctgctcgg acccgctgcc agcgtaatca tcggcgtggc tttctgtttc 120
 gtactttatt tactgaccta cgcgtacata tcaggcgag catcgatagt gtgggatctc 180
 cttcctcccg atattgctgg ccgcagctgg ctgccgatca ttttgcgtgc gctgacgacc 240
 tcgctgattc tgtggggccg cggaattg cccggttttc tcctctccg ccttatcgcc 300
 gccaaattca ccctttttct cctgctgttc gccggtgccg caggaggcgt aaaagtactc 360
 agattactcg acttcgccgg cagcacgccg ctccagtatt acctgccgat cgtaccggtc 420
 tgcgttatcg cttttggatt tcatggcagc gtccctctc tgacaagaat gtaccggggg 480
 gataatcatc gtgcggtcct ccgctctctc tattacggtt tcgccgtttc attaac 536

<210> 424
 <211> 282
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 424
 aaaagacaag ctgttgctgt ttaccgccgc gctggtggcg gagcgtcgcc tggcccgcgg 60
 cctgaagctc aactatccgg agtcctggc cctgatcagc gcctttatta tggaaggcgc 120
 tcgggacggc aaaagcgtgg cctcgctgat ggaggaaggc cgacatgtcc tgaccgcgaa 180
 gcaggtgatg gagggcgctc cggaatgat cccgatata caggtcgaag ccaccttccc 240
 ggacggctcg aagctggtca ccgttcacaa cccgattatc tg 282

<210> 425
<211> 587
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 425
atttcataaa ctcgattgg tattttgatt tgcattggac cgaccgagca atagccgctc 60
gtgatgctgg ttatgagatt cacatcatta gtcattttgt tgatagtaaa ataaccaata 120
aattcaaata gttagggttt atctgtcata acgttccgct tgctgccag tcattcaacg 180
tatttacttt tattcgagca ttctttgatt ctcgaaaaat aattaaagaa atagaccgg 240
atctgtgca ctgcatcact ataaaacctt gtctaattgg cgggttcttt gcgaaaaaaa 300
cgcagcgtcc agttattttg agctttgttg gccttggtcg ggtgttttcg gaaaattccg 360
ggcttattaa actactacgg cattttacaa ttaaagcata caaacatatt gcgagtaata 420
aacgcagtat gtatatgttt gagcatgata aagatagaag gaaaattggt gattttctcg 480
gtattgatat ccagaaaacc attgtcattg atggtgccg tatcaaccg gaaatatata 540
aatattcggt ggaacaaaag cgagatatcc ctgtagtgct gtttgcc 587

<210> 426
<211> 320
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 426
aggttcagg agctggaaaa acagtaagtc aagtacgaca agatattaca agccgattaa 60
ccacatatat tgaaagccct caagttgatg tcagcatagc tgcattccg tcacaaaagg 120
tttatgtaac tggatgaagt gcaaaactctg gaaaacaggc tattacaaat attcccctaa 180
ctgtgatgga tgctatcaat gcggcaggag ggcttgccg tgatgctgac tggagaaacg 240
ttgttcttac tcataacggg aaagatacaa agatttcatt atatgcacta atgcagaaag 300
gagatctaac ccagaatcat 320

<210> 427
<211> 280
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 427
tgattcaatt ttagtgatct gcacaggaaa tatctgccgt tctccaattg gtgagcggtt 60

attaagacgg ctattaccaa gcaaaaagat taattccgct ggggttgggg cattggttga 120
tcatgcagca gatgaatccg caattcgcgt cgctgaaaaa aatggtcttt gtctcaaagg 180
ccaccgtggg acaaaattta cctctgcatt agctcgacag tatgatcttt tactcgtgat 240
ggaatattct catctagaac aaattagccg gatagcacct 280

<210> 428
<211> 200
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 428
acatgatccc ggagaaatth agctggatta ttacttataa ccctctggcg agtatgatac 60
ttagctggcg tgagctatth atgaatgggg ttttaacta tgaatatatc tccatactct 120
atattacagg ctttatcctg accatcgctg gcttggccat ctttaataaa ttaaaatatac 180
gatttgcaga gattttgtaa 200

<210> 429
<211> 387
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 429
tggaaccagt gatcaatttc agtaacgtta cgaaagaata tcctctttac catcatattg 60
gttcaggat taaagactta gtctttcatc ccaagcgagc ttttcagctg cttaaaggga 120
ggaagtatct cgcgatcgag gatattcatc ttaccgtcgc caaaggtagag gcagttgcgc 180
tgattgggag aaacggcgca ggtaaaagca cttcgtagg actagtcgct ggcgtaataa 240
agccaacaaa aggctcggg actactcatg gccgagttgc ttgatgctg gaactcggcg 300
gtggttttca tccagagtta acgggtcgtg aaaatattha tcttaatgcc acccttctcg 360
ggctgcggcg gaaggaagtt cagcagc 387

<210> 430
<211> 225
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 430
gggtgcatcc caaacctgct gggtcagcgc caggttaccg ttcagcttct ggccgtagct 60
cggcacaata gcgtgaatgc ggctctgcc ctccggcgag ttaaaactgct gcgggaacat 120
ctgcttgagc acgttcaggg tgattggcgc ggcggtggaa gccccggcg aagcgccgag 180

cagcgcggaa atggttttct gctgatcgac caccacttcg gtacc 225

<210> 431
<211> 690
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 431
cctgctgcta ttgctgtcgc tggtagccca ggaaaaccgc caggcgctgg ccggggtggt 60
acgcgagcag tggcagacct ggacgctgct ggcggttttc tttatctatt acgccctcag 120
taatgtgtgg ggccatacgc cgcagcatat tgactcgccg atcaccacacg gcgtgtatct 180
gaccgggtat ctgttgctga tgacgatgct gctcagggac ggacgaaccc gccgactggc 240
gatgctggcg gtggtcggcg ggatcaccgt gctctccctg tggacgctga ttatcgacca 300
tacgctgggt ctcaccgaac gagcgtcttc ccccgagaac cccggacca cgaacgttat 360
cgaccttgcc ggttactgcg gcacgcat tttaatctgc ggcatgctac tgaaagaaaa 420
agccagccac tggctctatc tgccggtggt catcatgctg gtgatgctgc tgctcaccca 480
aagccgcggg ccgatcatcg cctggtgct ggcggtcggc tgtacgctgc acctgcacgt 540
cttcaccgcg cgcaacctgc tgatcgccgc ggcgctggcc gtgctggtag cgctgctttt 600
ggtcatgacg ccggtgggcg acatgtgct cgcccgtttc gaggagctgg gcacccaaag 660
cgggctgcgc ctgagcatct ggcaccatac 690

<210> 432
<211> 211
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 432
aatttaacct ggtttgataa gaaaactgaa gagtttaaag gggaagagta ttctaaagac 60
tttggtgatg atggttctgt cattgaaagt cttgggatgc ctttaaagga taatattaac 120
aatggttggt ttgatgtgaa aaatgagtgg gtttcattat tgcaacccta ctttaaacad 180
aaaatcaatc tttctgatag ttcataatct g 211

<210> 433
<211> 326
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 433

ggggagaata tccttgtctt taaacgcgcg ctgggggtga ccaccgggat cctgccgtgg 60
 aacttcccgt tctttcttat cgcccgaag ctggcgccgg ccctgatcac tggaaatacc 120
 atcgtcatta agcccagcga atttacgccc aataatgcc a tcgcctttgc cgagattgtc 180
 catcagggttg ggttgccgaa aggggtcttt aaccttgtgc ttggccgcgg agaaaccgtt 240
 ggccaggagc tagccggcaa tccgaagggt gcgatggtca gcatgaccgg cagcgtggcg 300
 gcgggagaaa aaattatggc cgctgc 326

<210> 434
 <211> 465
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 434
 gactcgcggg tgattaacac cgggcagggt tgtaactgcg tcgagcgggt ctatgttcag 60
 caggaatat acgaccgctt cgtcaaccgc ctccgtgagg cgatgaaggc cgtccagttt 120
 ggcgaccgg cgacgcgaga tgacatcgcg atggggccgc tgatcaaccg ggcggcgcg 180
 gaccagggtg cgggcaaagt gcgaagcggg ggcgcagggg gcgcgggtg cgctggcgg 240
 cagccgctg agggcaaagg ctatttttat ccgccgaccc tgctgctgga tgtacgtcag 300
 gagatggaca ttatccatga ggaaaccttc ggtccggtgc tgccggtggt ggccttttcg 360
 accctcgatg aggcgtggc gacggccaat gacagcgatt atggcctgac ctctcaatc 420
 tatacccgcg atctgaacgt ggcgatgaaa gcgattaagg gactg 465

<210> 435
 <211> 465
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 435
 atgaaacgac ctgattgcat tcgccactgg cgcgaactgg aagggccgga cgatgccact 60
 tatcccgaca gcccgagcgg tttttcgatt ggcgcgccgc tggggcgcg tttacgtctc 120
 aaccggttg ggatccacca cgagcgactg ccgcccgggc ggcgcacctc gtaccgcac 180
 gcggagagcg atgaggaaga gttcatctac gtgctggagg gctatccgga agtgtggata 240
 aacggctatc tctggaagct ggagccgggg gacagcgtgg gttttccgc gggtagcggt 300
 atctgccaca cttttctcaa taacaccgag caggaggttc gtctgctggt ggtggcgag 360
 gccacaaga aatacaaccg catctattat ccgctcaatc caggctatgc cgcgacgcgc 420

caggatcggtt ggggtgacca tccgccgcaa ttcttcgggc cacac 465

<210> 436
 <211> 270
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 436
 ttgcgtatat agaagtcata ccatcggtcg taagcggcaa cattgataga ttcagatgct 60
 tccagaagcc gggggatata ataaaccagt tcttcaaagg caatactgcc ttgagggata 120
 tcagaacggc tcaggcgaca aagaaggtta atcgtggctc gaaggatgat ccaactgctgt 180
 gccggggagg atgggagggc gttcatgctt atcgggaagt catgaggaat taaagcaagg 240
 atctgatttc cactggtaga cagctcacgc 270

<210> 437
 <211> 406
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 437
 gattcctgct ctgacaacca ttgttttaac catgaacgta gagtaacttc aggcacaggt 60
 agcctggcat attgagatag catgtaggat agcataaaaa atattttgcc cttggatgta 120
 aaaacgtttt ttaaacaaat cagaatagtt ctactctcgt tttattacca attatagctg 180
 gcacgtcagc tccttgctca atgcggacct ttcgctcgat agcttgtcgc ctccgcgcca 240
 gaagcgaaca gtgttatgag tggccagtga taaaacgtca gcccgttgac cttgccttac 300
 agcacctcaa ccaattcaaa ttcttctcgc atcaactcca tatcttcaga aaaatgacct 360
 tcagagctga aaaatctctg atgctctttc ttccagtatt caaggc 406

<210> 438
 <211> 401
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 438
 attgacggga tatctgacca gtcggggaat taaaaaacag gaaatcggtg aggtcaacaa 60
 tgctgcggat ctgcagaaac actgtacgct gtgttgcccg gcggtggtgt ttctgaatga 120
 agactgtttc gtgcatgatg atgaaagtaa tggcattatt cgccagatca ttacgcaaaa 180
 cccggcgacg ctgtttgtta tctttatgtc gctggcgaac atccatcttg accgctatct 240
 gcgggtacgg aagaatctgc taatcagttc aaaatcgata accccaaaag accttgatgt 300

tattctggtt aattatctta aatacaaaaa caccagtgtg gggcagttta ctttaccgac 360
attgtcactg agtaaaacag aatcaaatat gctgcaaatg t 401

<210> 439
<211> 450
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 439
cagcagcaag gtgtttaatg aggcggtggg ccgtcagggt gaattcgtcc aggacaacca 60
ttcccagtc cagaaacgcg tattacgcgg gttgcactat cagctggatc cgcacgctca 120
gggcaagctg gtccgctgtg tggaagggtga ggtgtttgac gtggcagtggt atatccgtcg 180
ttcatcgcct acctttggta aatgggttgg agcgggtgctc agcgcagaga ataaacgtca 240
gctgtggatc ccggaagggt tcgcccacgg gtttatggcg ctgagcgaca cgggtgcagtt 300
tgtctataag ggcacgaact actacgcgcc gcagtcagaa cggagtatca tttggaacga 360
tccggagata aggattgact ggccggcact gagcgactgc gtgctgtctc tgcggagaa 420
agacctgcgg gcacatactc tggccactgc 450

<210> 440
<211> 380
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 440
ggggagaaag agaccctcac catcattgac gaccttcttt gggcgccac cggcgtgag 60
ctgctggcag actgcacggc gacggcaatc cgtgaaacgc tgcgtaatcc ggcgctggcc 120
ggcacgtatc acctggtggc cagcggcgaa acagctggtg cgactatgcc cgctatgtgt 180
ttgaagtggc gagagcgac ggtgccgagc ctggcgggtg aggaagtga gggcattccg 240
aacgacggcc tatccgacgc cggcgaagcg tccgctcaac tcgcgcctgt cgaattaaaa 300
atccagcagg cattcggggt gactctcccg gactggcgtc aggggtgtggc tcgcgtggta 360
acagaagtcc tgggcaaata 380

<210> 441
<211> 180
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 441

agtaaattca ggctggctct ggtgcggcag aagtaccgcc cggacggcgg cgcagaacgg 60
tttgtctccc gcgcgctgga agccctcgac agcagtcatt tgcaactgaa cgtcatcacc 120
cgcgaaatggc agggggccggt gaaaccggac tggcagatcc atatctgtaa cccacgtaaa 180

<210> 442
<211> 689
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 442
tcatttgaag aacgacacag aggttcggtt gaagatatca agaaccgcct gagtttttat 60
ttacctttct tgtctcgtct gaaggatctt tatcccgaa gcgatgattgc ggatattggc 120
tgtggacgtg gtgaatggct ggaaatcctg actgaaaatg gtattgcgaa catcggcgtc 180
gatctcgatg atggcatgct ggcacgtgcc aagggaagccg ggctgaacgt gcagaaaatg 240
gattgtctgc agttttctgca aaatcaagca gaccagagtc tgatagcgtt gactggtttc 300
catattgctg agcatttgcc ctttgaggta ttgcagcagc tcgtcatgca taccttacgg 360
gtgctgaaac ctggcggttt gctaatactc gaaacgccga acccgagaa tgtaagcgtc 420
gggacctgtt cattttatat ggatccaacg cataatcacc ctttgccgcc gccattgctt 480
gagtttttac ctattcatta tggttttaac cgggcaatta ccgttcgtct acaggaaaaa 540
gaggctctca aatccccgga cgcagcgggt aatctggctg atgtgcttaa aggtgttagc 600
cccgattaca gcatcattgc tcagaaagca gcgcctgcag atgttcttga acgctttgaa 660
accctgttta cccaacaata tggcctgac 689

<210> 443
<211> 581
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 443
tgctcttatt atccaacctc tgcattgctg taaagcaaac tcttataatg atattggctg 60
tgcaggatgat gatactggag ataatatctc gtttaaaaaat ccattctact gtgagctgac 120
ggccatttac tgggtatgga aaaatgaatc tctttccgat tatgtcggct tcatgcatta 180
tcgtcgacat ttaaatctct ccacgcagca ggatcatgcg gaagataact ggggggtggt 240
gaattatccg ctaataaacc cggactacga ggcacagttt ggattaaccg atgacgctat 300
tcgtacatgc gttgagggga gtgatctttt actacctaaa aaatggctcg taacatcggc 360

tggcagtaaa aataatctcg accactacag caagggtagg tttttacata ttaaagacta 420
 caaggctgcg ctagaggttg ttgaagaact ttatccagaa tataagacag caatacagca 480
 gtttaataat gccactgatg gttattatac aaacatgttt gttatgcgca aagatatgtt 540
 cattgattac tcagagtggg tgttttagcat tctggatcgt c 581

<210> 444
 <211> 649
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 444
 ggtttaaggc aggtagtcag catattttgtg atgcgattga tacggactgg gttttctttt 60
 acgatgatga tgcttttcct gccagcgata tactggaaaa gttttttgct cttgaaaaaa 120
 aggaatgtca ggtctttact ggttttagtca aagatcttca cggccaccct tgtgcaatga 180
 atcttccttt caggaaagta ccttcacatt ttgctgatac tttacgttat attcgacccc 240
 cccaacgctt tgttcctacc attgacgaga gtgtcatggg tgagacagtt tcgtttgttg 300
 gcatgattat tagcagcaaa gtattgcaag agcatattga tcacatccat gatgaactgt 360
 ttatctatatt tgatgatctt tattttggct atgcgttgac attggacggg caaaaaatcc 420
 tctattcacc agaactgatt tttcatcatg atgtcagtat ccaggggaaa atcatctctc 480
 cggaatggaa ggtatattat ctgtgccgaa atttaatttt ggccaggaaa ctattccagg 540
 aagtaaaagt atttagcaat ttctctatcc ttatacgctt atgtaaatat ttatccatat 600
 tgccatggca gcgcagaaaa tcatcatatc tgtgtttcat gtatcgtgg 649

<210> 445
 <211> 606
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 445
 gtggcattgg tcgttatagt attgctatcg ccagagcgat tattagaaat aacaatcgac 60
 atgaggtttt catcgcgcta tccgctatgc tgggtgagtc gattactgat gttaaggcgc 120
 aatttgctga tctccagcca gcagacaaca tagtcgtctg gcatgctgca ggaccagtac 180
 gtgcaatgga taaaggtaat gaatggcgtc gggagagcgc agaactgatt cgggaagcgt 240
 ttcttgaatc attgcgtccg gatgtcgttt tcattacaag cttgtttgaa ggtcatgtcg 300
 acgatgcggc cacttcggta cacaaattta gtcgtcagta caaagtagcc gtactgcac 360

acgatcttat tcccctgggtg caggctgaga cctatctgct ggatgatgta ttcaaactcct 420
 attatttaca gaaagtggaa tggttaaaaa acgctgacct tctgctaact aactccgctt 480
 atacggcaca ggaagcgatt gagcatctgc atttgcaggg cgaccatgtg cagaatattg 540
 cagctgcagc cgatcctcag ttttgtatgg cggaagtgc agcgagcgag aaagagtccg 600
 tccttg 606

<210> 446
 <211> 450
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 446
 tgacctatca ctcgatatt gtgaaacaaa aacggttaat gaagttgtac cagccgctgc 60
 aggagcgatt cctcgccagc gtagactgca tcgtcgctc gtcgccaac tacgtggcct 120
 ccagccagac cctgaaaaaa tatcaggata aaaccgtggt gatcccgttt ggtctggagc 180
 agcatgacgt gcagcacgat ccgcagcggg tggcgactg gcgggaaacc gtcggcgata 240
 actttcttct ctctgctggc gctttccgct actacaaagg gctgcacatt ctgctggatg 300
 ccgccgaacg taaccggctg ccggtggtga tcgtcggggg cgggccgctg gatgcggaag 360
 tgcggcgtga ggcgccacag cgcgggctga gcaatgtggt gtttaccggc atgctcaact 420
 acgaagataa atacattctc ttccagctct 450

<210> 447
 <211> 507
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 447
 ttcaggcgaa atgctatgct cgcacgcgg acttcaaaaa gcaggggacc acgctgctgc 60
 tggtttccca cagcgccggg gatatcgta agcactgcga ccgcgccatt ttcctcaaaa 120
 atggtgacat ctgcatggac ggcaccgccc gcgacgtaac caaccgttac ctggatgagc 180
 tgtttgga accggataaa gacagcgcga caaaaagcgc aacggctatc tcgtcagcca 240
 gtggcgaaag ccagatgtct ctcgatgaga ttgaagatgt gtaccacacg cgcccaggct 300
 accgtccgga agaatatcgc tgggggcagg gtggcgcgaa aatcatcgat tatcatatcc 360
 agagcgccgg ggttgatttt cctccctcac tgacgggcaa tcagcagacc gattttctga 420
 tgaaggctgt gtttgaatac gattttgatt gcgtggtgcc tggcatcctg attaagaccc 480

tcgatggctt attcctctac ggaacca

507

<210> 448

<211> 678

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 448

gctatgaact gatcctggtg aacgatggtt cgacagacaa cagcctggcg gtgatcgccg 60

aatggcagga gcggtgcag aacgtccagg tgctggagca ggaaaaccag ggcgtctcgg 120

tcgcgcgcaa taccggcctc gccgccgcca gcggcaaata tctcgcgttt ccggatatcg 180

acgacaaaact ctatccgggc atgtatcgca cgctgctgga gatggccgag aaagaacatc 240

tcgatatcgc cacctgcaac ggcacctatg tgtacgaaaa gcgccgcgag agccaccgga 300

tcttcccact ggatcgccctg cctcgcacgg gtgtgctgcc gggccatgtc tggcttaagc 360

aggccctgga ctgcggaag tttctgcacg tcacctggct taatatattat cgtcacgact 420

ttatccgcca gcatcacttc catttcgagc ctggcctgcg ccatcaggat atcccatgga 480

ccacagaagc cctgctggcc gcggagcgcg tgcagtacac cagtcagcag ttctatgatt 540

actacattca ctctgagtcg gtgtcgcata agccggacaa cgacgacacg ctgatgcgtt 600

cggcgcgcca ctatatgaag attctggaga tgctggaggc gattaaccag cgctaccggg 660

ataaagtacg ccatatcg 678

<210> 449

<211> 585

<212> DNA

<213> *Klebsiella oxytoca*

<400> 449

ctctgcctct attgctcttg ctctcacagc gcccgtagat tcatttgcag ccagcgatca 60

gcgtgggtac aaacctgaag acgtcgcttt tgatgaaagt ttttttctgt ttggtggcca 120

tgtagggact tctggtgaat atgaagataa ggtaactcgt ggtttcaata acacggataa 180

aaaggagaag acgattacca atgaggtttt caactttttt tataacaatc cacaatggaa 240

ttttatgggt ttttactctt ttaaaataga aaatagagag caaaaggagc ctggttatta 300

tgagaatgaa gatggtatta agcagctttt ttcatagaat aaagggtcatg atcttggtaa 360

cggttgggct actgggttaa tttatgagct agaataatac agaagtaaag tttattctcc 420

ggatgttagt ggtctacgta aaaaccttgc cgagcacagc attagacat atttaacct 480

ctggaataat gattataata tgggattcta ttctaattctt gaataccttt tgagtaaaga 540
 agatcgcaat gcatggggga aaaggcaaga gcagggatat agtgc 585

<210> 450
 <211> 340
 <212> DNA
 <213> Klebsiella oxytoca

<400> 450
 tatcgatgcg gatgaaaatt gcccaactac atcgtttctct gaaagaggag gggcatcctg 60
 ctacaatgat ttatgttact cacgatcaga ctgaagcgtt aactctagga gatcgcatctt 120
 gtgttcttaa ccatgggaat atcatgcagg ttgatacacc tactgatctt tataattatc 180
 ctaataataa gttcgttgcc agttttatcg gttcaccatc aattaatttg atagatactg 240
 ctatccgtaa gaataatgag aggttgatg ttgaaattgc tcctggcgtt gaaatattaa 300
 ttccacatag taagcaagtg ttgcttgaag gttatattaa 340

<210> 451
 <211> 608
 <212> DNA
 <213> Klebsiella oxytoca

<400> 451
 atccaatgac cagaaatgag ctgcgtagcg cccataataa gaaaagatgc cggaatatata 60
 cgcattgctt ttccctcaga caataacata gttactcctg aaatttgatt tgctcatcaa 120
 tgatattacg agcacggtca agtgctgctt ttggcgcttg gtcattgatc cacatatcgg 180
 taatcgcatc tgccagtggg gaccataaat aaccatttc cggaatagat ggcattggcat 240
 cagagtgaag cccttgctta ataattgcgc tcgtcgcttc atttgcagtt ggtaggattt 300
 tgttcatcag attcggtacc ggaggtatag attctgtcat ctcatagcgt ttcattaaca 360
 tttcatcaga tgagagatag tcagcgaaaa gttgtgccgc cttaggcgat ttactataag 420
 aagagacgac cgccaggcga accgtagaaa acgaacgtgg ctgttttcct tcaagagtag 480
 gtatgggaac aacgccaaaa ttaattttac tgttgttata tccttggtt gcccatggac 540
 cgtcgatgat ggcagctact ttgccttcag aaaataagcc tcgacgcacc tgtggattac 600
 gcataatct 608

<210> 452
 <211> 589
 <212> DNA

<213> *Klebsiella oxytoca*

<400> 452
 cgtaaatatg ggacaaaagg ataaaccggt aacgccaaga tcttgcaaat aatcaagttt 60
 gttaataatg ccctgcaaat caccgccc ataaagttttt gaatctggag gcgttcccca 120
 cggttgtacg ttttctggcg atatcgatgg atcgccattg caaaatcggt caggaaagat 180
 ctgataccat attgtttttt taaccatttc tggcgtagaa agtacatcac ctggattgat 240
 ataagggaag caaaaaaagt tggacaagtt actcagttct gtctctgcta cagggtggtt 300
 acttatatca acacagcgtc gttcaccaaa taataatttt tccccgttat ttccgtataa 360
 tataaaacca tagcggctac gtcgtttgca cggagtaa atgcgcaaac agtggtcata 420
 gctctcgctt tgtccctctt tttccatgtg aacttcgttg ccgccgctcc atccatgcgc 480
 gtcgctgcgc ccaaggtttc caccatctag gccaccttcc tccattgat agggatcgcc 540
 gatccacaga gagactttcg cgacctcgcc tttgactgtg cgaaatcta 589

<210> 453

<211> 528

<212> DNA

<213> *Klebsiella oxytoca*

<400> 453
 gcaagggtag aggtgtattg cgccttttcc ttattagcca tcgccgcata ataggcaaaa 60
 cgatattctt cataatttaa gcgaattatt tctggtagat aattatttgg acagtgtcgg 120
 cttaatacac tttttagact taacggaaag tctgagtgtg ttgttgctaa tccactgagc 180
 actaacaatc taggttttaa aaccattatt ggatcaagta aggtctctgg tagttgatcc 240
 atccacattc ggtagacttt ttgcgccc atgcactgc catcaactcc ctgaattatt 300
 tctaaggcac tcttccgctg aagagagaac tgaaaatact gtctttcgat cccggatgtc 360
 gaaatgaatt gatgaacgca tcctatccc cagcattcgc aaaccggaga tataccatca 420
 atgagtggct gataattttt caatgggaga tgagcccagg aaacatttat tgcattgtca 480
 aatacgctat catcgttgta tttatcgact acacaaagtt cacagcca 528

<210> 454

<211> 510

<212> DNA

<213> *Klebsiella oxytoca*

<400> 454
 ataagccatg tggtttcttcc cgatgggaaa gcattagagc atttttcata tcaatcacta 60

gcatgaagcg atgtgatgga taaatctttt catctatttc aaatcgagag tacaattcga 120
 tagattcatg tggtagcgcg agtcgggttaa atgagaacac gataatccga accccgcgct 180
 caacggcatt aatgagttct tgagcaatga gttcaagatg gaagtcagtg ttcaggtaaa 240
 cttcgatttg agccagttcg agcattttctc tggctttttg tagtgaatta tcaaaaccag 300
 agacgttata tatgaactct ttctcttcct gtagcatcat acgtgagagt tcttttttta 360
 atacattgat gttttcaatg gtttgctttt ctatgttgct gaaaataagc tcgggagatt 420
 ttgcttgata ctcttttagta ttgccatcgg ccataaaaat gaagccattt ttatatagac 480
 tatcaattga tgagtagacg ctagaacgtg 510

<210> 455
 <211> 383
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 455
 gccggtaatc ttgagctgct ggcccagggc cgtagcgtgc gcgtggatgt ggccgccggc 60
 gccgaagcca tcatgaaagc ggtcgacggc tgcggcaggc tcgataacgt caccggcgaa 120
 tccggcacca atatcggcgg catgctggaa cacgtgcgcc agaccatggc cgagctgacc 180
 aacaagccga gcagcgaaat atttattcag gacctgctgg ccgttgatac ctcggtaccg 240
 gtgagcggtta ccggcgggtct ggccggggag ttctcgctgg agcaggccgt gggcatcgcc 300
 tcgatggtga aatcggatcg cctgcagatg gcaatgatcg cccgcgaaat cgagcagaag 360
 ctcaatatcg acgtgcagat cgg 383

<210> 456
 <211> 400
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 456
 cctgctctat tccgtcagga gttttgccgc cgcgatgctc gcctattacg ttgccctggc 60
 gattggcctt gaacgccctc atggggactc atcaccgtct acatcgtgct gcaaacctcg 120
 gtgggcgctc cctgtgcaga agcctttatc gcctggccgg taccgtggcc ggcgcggggg 180
 ccacggtatt gattgtgcgg acgtttgtga atacgccaat tctatgtagc gtgattctgg 240
 ctggctggat caccttctgc ctctatttat ccctgcttga acgcacgcc cgcgccatg 300
 cctttgtgct ggccgggttat accgcaagcc tgattggttt tcccgcgctc gccgatcccc 360

gcacgtgttt aacatcgccc tcatccgggt acaggaaatc 400

<210> 457
<211> 535
<212> DNA
<213> *Klebsiella oxytoca*

<400> 457
ggctgtctgc tatggattta ctctgcctgg cccgatggcg gcacggcggg gtcgattctc 60
ggggtttget gcacgtgtt tggcagtttc gacacgccgg ccccgcatat tgtgaaatat 120
attatcggct ctgtctgggg cgtagtgata agccttatct atagcttcgc cctgcttcct 180
ccgctcagcg atttccccgt gctgggtggcg gtgcttgccc cggctctatct gcttgccgga 240
tcgctgcagg cgcggccccc caccaccttt atggccatgg ggatcacctt gacgctgccg 300
gtactgtgcg agctgggcgc gcgctacagc ggcgacttcg ccgacgcggc caacaccgcg 360
atcgccctgt ttttcgcgac cggctttgcg gttatcggca tgagtctgct gcaaaccgta 420
caggcggacg cggcgataaa gcgtctgctg aaactgtgcc aacgcgatat tcgccgcagc 480
gtgagcggcg tatttaaagg cgatgaaacg cactggacca atctgatgat cgacc 535

<210> 458
<211> 400
<212> DNA
<213> *Klebsiella oxytoca*

<400> 458
tggcgtttat tttctgaaa cagtatgcgc agacgccctg gacgcgcgat ggccgggttc 60
gggcagatgt ggtgcagatt gcgccggatg tttccgggcc ggtgagcagc gtggcgggtgc 120
gggataatca gtgggttaac cgcggcgatg tgctttatgc catcgacccg cgtgggctga 180
agctggcggg gctcagcgcg caggccgacg tcgaagcaaa acgtcatgaa atgctgatgc 240
gccaggatgc cgcgccgcca cgcgcgctca tcaaaggggt catttccggc gaggatatcc 300
agcaaacagg cagcgcagct gctgttcgcg gcggccaatt atcagggggc gctggctgcg 360
ctggaactgg cgcagtgaat cttatcccat gcaacgctac 400

<210> 459
<211> 260
<212> DNA
<213> *Klebsiella oxytoca*

<400> 459

cgttctcccc tgattcttgc cggcaccg cggaacttaca gctatgcagg aaccggtaac 60
 gtagtagcga tcgctcgcga tctggctaag atctgggata ttccttttagc agtccacctc 120
 gatcaccatg aagatctggc cgatatcacg cgcaaagtac aggccggtat ccgctcggtc 180
 atgatcgacg gatcgcattc gccttttgaa gaaaacgtcg cgttagtcaa gagtgtgggt 240
 gaactgagcc accgctatga 260

<210> 460
 <211> 456
 <212> DNA
 <213> Klebsiella oxytoca

<400> 460
 cggcgcattht aaaatatcaa tcggttgatt taaatgaagt gatcacgcat tcgcttcaac 60
 tggttagcca ggatgccgcc agccgggcaa tatctctgac gtttaccgag cagcccgagc 120
 tatgccgcat ccaggccgat ccgatcggtt tgaaacaggt gctgcttaac ctttatctca 180
 atgctgtcca tgccattggc cgcgagggcg tgattacggt ggcggtgagg gagtgcggcg 240
 atggcgaggt caaggtgagc gttgctgaca gcggcaaggg aatgacggcg gaacagctac 300
 aggccatttt cacaccgtac tttagtacca aggcggacgg caccgggctg ggcctggcgg 360
 tgggtgcagaa catcgttgag cagcacggcg ggacaattga cgccgagagc gccccggca 420
 agggcgcgct atttacgttc tatttgccgg ttaatg 456

<210> 461
 <211> 536
 <212> DNA
 <213> Klebsiella oxytoca

<400> 461
 tattgaaggc accaccagcg acattcgctt cgtccacaac gttctgttcc cgtacgcccg 60
 cgaacgcctg gccggtttcg ttaccgctca gcagtttgtc gagccggtga agaccattct 120
 cgataacctg cgcgaagaga tcgccagcc ggccggtggc gccgaagaac ttattgctac 180
 cctcttcgcc tttatggatg aagaccgcaa atcgaccgcc ctcaaggcgc tgcagggcat 240
 tatctggcgc gatggctacg ttcatggcga ctttaccggc cacctgtatc cggatgttct 300
 gccggcgctg gaaaaatgga agtcacaggg tattgattta tatgtatatt cctcaggctc 360
 cgttgctgag cagaaattgt tatttggtca cagcgatgaa ggtgatatta ctcatctgtt 420
 caacggctat ttcgataccc tggtaggtgc caagcgtgaa gcgcagtcct accgcaacat 480

tgctgagcaa ctgggacagc ctctgccgc catcctgttc ctgtccgata ttcac 536

<210> 462
 <211> 557
 <212> DNA
 <213> Klebsiella oxytoca

<400> 462
 cctggagtgt gcataagggc tggcatcgcg acggtaaact gcggatgggtg ccggtcgcgc 60
 cgcaacctac ccgggcgacc accgatgcgt tctatccgct gatcctcaac agcgggcgga 120
 tccgcgatca atggcacacc atgaccgcga ccggcgcggt gccgcgtctg atgcagcata 180
 ttaacgagcc ggtggtggag gtcgcgccgg cggacgcgca gcgttatcac ctgctggaag 240
 gtgaactggc gcgggtccgc tcaccgaagg gggatgatgt cgcaaaagt acgatcggcg 300
 acgggcaacg gcccggtcg ctgtttgtgc cgatgcactg gaataatcag ttgctcgtc 360
 agggacgggt gaacaacctg ctggctgcgg tcaccgaccc gcactccggg cagccgaaa 420
 gtaaacagac ggcggtggcg atagccacct ggcttcctgc gtggaaaggc gagctttttt 480
 cgcgccagcc ggttcgctg cccgcttcgc tgcaactggc gcggcggcg gcgcagggca 540
 ttatccatct ttcgctg 557

<210> 463
 <211> 231
 <212> DNA
 <213> Klebsiella oxytoca

<400> 463
 acacgcatat aaaccgcaac cgccggccag cgccgataaa gcgcccggcg aaattattac 60
 cctgccgcgc ctgcaggtgc gcaaaaccac gcctccgctc agccgctggc tgcgcgatgt 120
 tacccaacgt cttctgccgc cgctgctcgg gctgggattg ctgctgctgg gctggcagct 180
 ggcggcgatg aacagcaaag gtttcccgc gccgctctcc acgctggatt c 231

<210> 464
 <211> 459
 <212> DNA
 <213> Klebsiella oxytoca

<400> 464
 gcgataagtt ttcgatttca cggcgacgtt tattacagac gggggcggcg ctgggcggcg 60
 cgatgctgct ccccggcata atgcaggcgg cgtgggcggc tgggtcggat aaaccggaac 120
 agaccaccgt gcgggtgggg ttattccgc taaccgactg cgctccctta gccattgcct 180

| | |
|---|-----|
| ccctgaaggg gttcgataaa aagtacggta tcacctcgt gccgagcaaa gaggccagct | 240 |
| gggccgcggt gcgcgacaag ctggttgccg gagagctcga cgccgcgcac attttgtacg | 300 |
| gcatgtctta cggcctggag ctggggatcg ccagtaaacc gcaggcgatg gccaacctga | 360 |
| tgaccttaa ccgcaacggc caggcgatta cgctctccag cgagctgcag gaacagggcg | 420 |
| tcaccgacct gagcgggctg aaaaaacgga tcggtcagc | 459 |

<210> 465
 <211> 594
 <212> DNA
 <213> *Klebsiella oxytoca*

| | |
|--|-----|
| <400> 465 atgtcatggt tccgatactg tctgccgatg aaaacagcct ggtgctggtc tgggaaaaac | 60 |
| cggagtctga gaccgagcag gtggtggact acgccgtcta tcgtcaaggc gagcggctgg | 120 |
| gcctggcgcg tgaaaaatcaa aaccattttt ccccgcaaa gccctatatatt gataacttct | 180 |
| atcagcggat cgccagcgac ggctggcagc agaaaaatcga tctgcgcagc ttcacggcca | 240 |
| ccaacctgca gccgatacag gagtatgcct ttacggtgcg cgcggtctac gccaatggcc | 300 |
| aggaatctcc ggacagcgcg gtggttaaag cgcaaaccg caaacgccg cacgtcatcg | 360 |
| aagccagcac attcggcgcg aagggtgacg gcaccacgct gaatacccag gcgctgcagc | 420 |
| gggccattga tagctgtacc gtcacgcaact atcctcaggg ctgcaagggtg ctgatttcg | 480 |
| gcggcgaatt caaaactggc gcgttggtcc tgcacagcga tatgacctg gatattgcgg | 540 |
| ctggcgccac cctgctgggt tcggacgac cggccagta tccgcttgat aaag | 594 |

<210> 466
 <211> 625
 <212> DNA
 <213> *Klebsiella oxytoca*

| | |
|--|-----|
| <400> 466 aagctggaac gtactaacga cggatttatt acctcatggg cggcaacggg cagtaatgaa | 60 |
| tgggtaagcc agcgggttcc tcacgccgat ctgattgctc agcaggataa agaacattac | 120 |
| tacgtcgggt tcttcgcctc acgtaacgcc aaaatcaccg tcagcaatgc ttccctgacg | 180 |
| acctccgcgg caaatacgggt tccctccgcc ccgtatgttg ccaaaagctg gccgccggtc | 240 |
| atgcaaattg cctcggggac aaaaagccag agcaaagagt atctcctgca ggcgcgacg | 300 |
| aatagtgcg gacgcatcac cgtgcgtcag gatgaagtgg tgatcgggca ggataaagcc | 360 |

gtgaaggccg gagagatgta taccagcct gccgttctga aagataaaag cacattcgaa 420
 attagcttca ctccagccac cggcgcaaac acgctgaccc aaacgctgac ggttgaacag 480
 agcgccaatg tgacaggcaa tacgctgtac gccgcgccg atgggctgtc gcaggctaaa 540
 gggacgacgg actcgccgct ggatttagcc accgctgtcg acctcgttcc ccctggcggg 600
 caaattgtat tagccgcagt gatta 625

<210> 467
 <211> 503
 <212> DNA
 <213> Klebsiella oxytoca

<400> 467
 acaggatagc gaacacctcg atattctacg ccagcttacc catgcatga gcgacgagcg 60
 cgtacctgaa gcgtatcagc gcacccccag agctccgcag gcggtgctgg agattctggc 120
 cgggatatct ctctgcca gggggaagat atggaccgcc tccggtgata cgatgaagag 180
 gcgacgttta ccctacgca atccccacgg actgcacgcg cggccaagcg cggctcctggt 240
 gaaagcggtg aagcagtggc gatcgcaa atcggtggaa aatctcgaca cccgttccgc 300
 tattgttgac gccaaaaatc tgatgcgggt cgtttctctc ggcgcaaagc aggggcatcg 360
 gctgcatttt atggccagcg gggaagatgc ccatcaggcg ctggaggcta tcggtacggc 420
 cttaaatgcc ggattaggcg aaattgccgc acagccgcag caggtcgttc agccagcaga 480
 aaagcctaaa cggagctggc ttt 503

<210> 468
 <211> 534
 <212> DNA
 <213> Klebsiella oxytoca

<400> 468
 atccatcccc tgacactcaa tacggcaatc gatatgaata tgttttgca tccgctgaag 60
 ccgtcggcag tgaaccgaac ccgacacacg gaatattgcc caaatggtaa aggagtgaac 120
 gtatcgctga tattaatatc ttatcagcag ccactcaca ttataggtat tttcgtggt 180
 ttcactggcc gttatattgt ggaagagtta cgtcagaaaa aaattaaagt gacgccggca 240
 tgggtctctg agccaccag aattaatat tttattaatg acggcgctga ggaatataag 300
 ctctgtaatc ctggagcaaa aattgatgat gagtgtaaac agcaggttat tcatcatctg 360
 caatgcgtcg cctctggtga ttatttagcg atcagcgga gcctgcccc ggggattgaa 420

agccgatttt atgctgaaat tattgaatta tgccagcaga aaaggtgtga agttatcctc 480
 gatatacagcc atccggtcct gcgccagctg cttgaattac ggcctttgtt gatc 534

<210> 469
 <211> 599
 <212> DNA
 <213> Klebsiella oxytoca

<400> 469
 gcttcaggtg ttgaaaatgc gattacgccc gcggatttaa aagatattta tggcgttatt 60
 attgccgctg ataaagacgt taacgccgag cgatttaatg gtctgccggt cattgaagtt 120
 ccggttaaag aagccattca ccatccggcc gacttaatta ataaatttat cagcggccag 180
 gcggcgcgtc gtcagggtat ttctgcctcc gccgattcaa cgagaaaatc cgagcgggag 240
 tttttcgggc ccaaggtata taagcacctg atgagcggcg tctctaacat gctgccgttt 300
 gttgtcgcg gagggatttt gattgccatc tccttcctgt ggggcatcta ctccgccgat 360
 ccaaactcgc cgcaatataa cgttatcgcc gccacgctaa tgaagtgagg gtcaacaggg 420
 ctttctcaat tcatggtgcg gattttcacg gcttatatgg cctggtctaa ttccgggcgt 480
 cccggtaatg gtgcgcgggc tttgtcggtg ggcataaagc caaacgcaac cgcgcgacag 540
 gcttttctcg gcgggattat cgccgggtct cgccgccggg gttattttat gctgctgct 599

<210> 470
 <211> 675
 <212> DNA
 <213> Pseudomonas aeruginosa

<400> 470
 caagcacaac aagaaatacg tcgtcgcctt ggaccagggc accaccagct cccgcgccat 60
 cgtcttcgac cgcgatgcca acgtggtcag ccaggcccag cgcgagttcg ccagttcta 120
 tccgcaggcc ggctgggtcg agcacgaccc gatggaaatc tgggccacgc agagtctgac 180
 cctggtcgag gccctcgccc aggccagcat cgagcgcgac caggtggccg ccatcggtat 240
 caccaaccag cgcgagacca cggtaggtctg ggaccgtcac agcggtcggc cgatccacaa 300
 cgtcatcgtc tggcagcgcc ggccagcgcc ggcatctgc gcgcagctca agcgcgacgg 360
 gctggaagac tacatccgag aaaccaccgg gctggtcacc gatccgtact tctccgggac 420
 caagctgaag tggatcctcg acaacgtcga aggcgcccgc gaacgcgcgc gcaacggcga 480
 cctgttggtc ggaccatcg acacctggct gatctggaag ctaccgaag gcaaggtcca 540

cgtcaccgac tacaccaatg cctcgcggaac catgctgttc aatatccaca gccgcgactg 600
 ggacgcacgg atgctcgagg tgctcgacat tccccgctcg atgctaccg aggtgcgcaa 660
 ctcttcggag gtcta 675

<210> 471
 <211> 630
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 471
 gagcgacctt ggattctcga agatcctgtt cggcctgttg cctaaggaca gccaggacta 60
 cgagaacgcc ttcacgctcg gcaactaccc ggccgccttg cgcgagcatt acgaccgggc 120
 tggctacgcg cgggtcgacc cgacggtcag tcaactgtacc cagagcgtac tgccgatttt 180
 ctgggaaccg tccatctacc agacgcgaaa gcagcacgag ttcttcgagg aagcctcggc 240
 cgccggcctg gtgtatgggc tgaccatgcc gctgcatggg gctcgcgcg aactcggcgc 300
 gctgagcctc agcgtggaag cggaaaaccg ggccgaggcc aaccgtttca tggagtcggg 360
 cctgccgacc ctgtggatgc tcaaggacta cgcactgcag agcggcgccg gactggcctt 420
 cgaacatccg gtcagcaaac cgggtggtct gaccagccgg gagaaggaa tggtgcagtg 480
 gtgcgccatc ggcaagacca gttgggagat atcggttatc tgcaactgct cggaagccaa 540
 tgtgaacttc catatgggaa atattcggcg gaagttcggg gtgacctccc gccgcgtagc 600
 ggccattatg gccgttaatt tgggtcttat 630

<210> 472
 <211> 324
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 472
 atggatgctc gggacttgcc gcgcgcttcc atcgatgaag gtacgcaggc gcttcttctg 60
 cccagcggg ctgatccgc ccaccaggta gccggtggcc cgctgcgcg cctgcggatc 120
 ggccatgtcg gccttcttcg cccccgccg atgggcccagg gccttcaggc cgagactgcc 180
 gatcaccggc accaccgcca ccagcaactc gcccttctcc gtggcgcgca gcagcgtctt 240
 gaacaccgc tgcggttcca ggccgagctt ttccgcggcc tccaggccat aggaagggtg 300
 cttggggtcg tggtgtagc tgag 324

<210> 473
 <211> 669
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 473
 gatcgtctct gccagtgcca tcaccttgcc caagggcggc gacgtgcacc tgggtgccgcc 60
 tccgcccaag ccttgctgga ccatcgtggt gcatggcgtc aacgatctcg cgggttgcta 120
 cgaacggatc gagcgagggc tctgccaggg gctcaatgaa cgcctggaca tgccgccgac 180
 cttgcccggc gggcaggcca atcccggcta cctgacgcgc gcgggtctaca gcctgccggc 240
 ggacgacgaa ggcaaggcag agaaccgccga cgtcgtctac taccggcgca agttcgccag 300
 tggcgccggc ggggccgcgc tacgcagcgt agtcgtacct ttctactggg gttccgcga 360
 ggaagagcaa tacatcaaca agaccgcggc ccacggcgaa tggctggacc gcaacggcaa 420
 ccggctggac aagtccggca ccaaggaagg cgggcagttc gtcaatgccca ccaccaacct 480
 gccggacatg tggggccagg gtttcaacgg caagctgttc ggtttcatct cgctggactg 540
 gttcggcggc accatgaccc atccgctggt ttcggcgga gggcgcaagt acatggtcct 600
 tgcggccatg cgcctggcca tgttgatcaa gatcatccgc aagcgttacc cggacgacac 660
 catcaatgt 669

<210> 474
 <211> 810
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 474
 aggagagaac atgagtcgct caccatccc tcgccaccga gcgttgctgg ccggtttctg 60
 cctggctggc gcgtgtccg ccaggtgctc caccaggaa gaaatcctcg atgcggcaact 120
 ggtcagcggg gattcctgcg aactgaccga cagccacctg gtcgccctgc gcctgcagca 180
 gcaggtcgag cgcacccgcc agaccgcac ccagttgctc gacggtctct accagaacct 240
 cagccaagcc tatgatcctg gcgcgccag catgtgggtc ctgccggcca acccgacaa 300
 taccctgccc ttctcatcg gcgacaaggg gcgcgtgctc gccagcctga gcctggaggc 360
 cggcgccgcg gggctggcct atggcaccaa cgtgctcacc cagttgagcg ggaccaatgc 420
 cgccacgcgc ccgttgctga agcgggcggg gcagtggctg gtgaacggcg acccgggcgc 480
 ggccactgcg aaggacttca aggtcagcgt ggtcgggggt gacaagaccg ccgccctcaa 540
 cggcctgaag agcgcgggcc tgcaaccggc ggacgccgc tgcaacgcgc tgaccgacgc 600

cagttgcgcc agcaccagca aattgctggt actgggcaac ggcgccagcg ccgctagcct 660
 gagcgccacg gtgcgcgcac ggctacaggc cgggctgccg atcctcttcg tgcacaccaa 720
 tggctggaac cagagcagca ccggccagca gatcctcgcc ggcctgggcc tgcaggaagg 780
 cccctacggc ggtaactact gggacaagga 810

<210> 475
 <211> 524
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 475
 aggagcaact gaagcgactc ggcatcgagg ccagggccgc ggcgatgcc tacgctcgac 60
 tgggcgagat gcagcgtggc ctggatatgc aggtccgcgg cctgcaacgg ctggagcagg 120
 ccagccaggc aatgccattg gctagcgcac ttcccgact ggtcgtggaa gccagcaaga 180
 cggctgccgg ttatcaagcg cggttgcgcg acctgtcgat ccgcaacggc ctggacgtcg 240
 gccgggagcc agccttggca tccctgatcc aggacagcgc caaccagagc ggcctgggac 300
 gcacggtgac gctggacatg ctggagcact tgaacgccac cggcatgggg ttccgcccg 360
 cgcaaatgaa tctgggactg gcgggccgct tcggctttgg ccaagggatt gcttcagccg 420
 aggttgccgg gctggttcga gcgttgcaac tggcccaggg ttcggaactcg ccagagcaat 480
 tgtccgccac cctcgaccgc ctggtcgtcc tgggtaaagg caga 524

<210> 476
 <211> 704
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 476
 aaggttgcca ggatcaacga tcagaaaatg cgcgccatgg aggcgcgcgc ggaaaaggct 60
 ggcaaggcta tcggcaaaaag cctggacagt tcggcactga ttgccagcag cgtgctggac 120
 caggcgctgg acatgctggg caggaccagt cgccaggcgg gtcaggccaa gaagcctgtg 180
 cagagcggcc aggacaaggt actggccgag tggaagaccc ggcagaagga gctgggcgaa 240
 gcctggaaga gctatcgcca accactccag gatctgtcca agctcaacga agcactactg 300
 aagaactctt ccgacaagct cgacaaggcg ctgctcaatc tcagcgagac cggcaagctg 360
 tcgcttgcca acgtgggcaa ggccgcctac gccgatgctg cgcgcctcgc ctgcggcag 420
 atgaccctga tgctgctgga cgggctgttt ggctgggtcg ccagcgctcg taccgagaag 480

cccaaggtcg acgacaaggc gggcaaggga caggcgaagg ctggcgacga cgagaaggaa 540
cagccgtcgc tccagtcgca ggtcttcaag cagtggctgt tgcagatgaa cagtgtctgg 600
ggcgccctacc gcgcgcccct gcaggatata tccgggatga ccgacgagct gttcaggaat 660
gcgtcggaga agctcgagaa gtcgtgttc aatttcgcca ctag 704

<210> 477
<211> 234
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 477
aggcatccat cgagctaccg gcaggcccg cgcagaccct gctgggtccg ttgcgggagg 60
tttcgccaga ggctctgggc atgcgtgcgg ggccgccgat gccacagatg gtcgaaggcc 120
agcgggtgct gctggcgcca cgcgtggagg gtcgtctgga ccgcgccagg gtcggagcgc 180
tgagcctgtc cctgcgctcg ccgcaagctc ccagagtat cctgctcgga cggt 234

<210> 478
<211> 349
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 478
gcgaggagg attcgacagc ctcttgaga tgcgctggc gatcctgctg aacctggggc 60
gcgcggaaca ggctctggcc ctgatcgcg agatggagga gaaggtcgag ggcgcgagat 120
ggaacaacat cagccagcca cggcgtctgt acaaggccca cggcctggcg ttgctggggc 180
gcgacgagga ggccctggag gcgctgctgc cgttctccga gattgccccg cgctaccgta 240
cgatctggct gcgcgccgct tacctgctgc tgcaacggac ccctgagcgc aacacctggg 300
acttcggcgg gcgcctgcag cagatgctcg aacactactc gcagaaggg 349

<210> 479
<211> 402
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 479
aaggacttct ggtcgggtgct cgaaccgcag gacggccagg ccgcactgat ggcgcggatg 60
ctcgagcttg gccacagcca gccgttgag ccgaatgcga agatccccga aggcctggac 120
atttcgatca accgcgcca ccagtgcggc acgcccggca gcacgatgc gttcatccgc 180

aagaacccag gttccggcat gcctttcgcg gtggccgggc tgagcgacga cgaatacgcc 240
 actttgcaga agtggctggc cgcgggcgcc ccggtcgacc agcagccgtt gcggccgacc 300
 gccgccgagg cgcgccaggt ggccagctgg gagcgtttcc tcaaccagcc tggggccaag 360
 cagagcctgg tctcgcgctg gctctacgag cacctgttcc tg 402

<210> 480
 <211> 514
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 480
 ttccctaacg aatgctgtca atcgccctgt tcagattgct ggtagtggac ccggcgcata 60
 cgttgccacc ttccgggtgc tgctcgctgta ttccgaccag gctggtaaag acagtgacaa 120
 ggttcctgcc ggcgctcgca atgcattggc actggaggcg tccgctctgg ggcttcctgg 180
 cacggctgat ttgcaaagcg tcgccaaggc aggtggcacg gttgatatgc cggtagcact 240
 cacgagtgtc gcacaagaga gcccagtggt taaatcgagc attgccgcga tgttgaccaa 300
 cgggtgcaact gtccccaagg gcgtgcctgt tcgcgcgcgc accctcaatg ctgcgacggg 360
 ccggtatgag gtgacgggtc ccgcaaagtc caccgtgccg aatacaccac cgctgatctt 420
 gacctggacc cctgccaccc ctccaggaag ccagaacccc tcaagcacca ctccggtcgt 480
 accgcagccg gttccgggtg atgagggagc aacg 514

<210> 481
 <211> 604
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 481
 cgagcaccaa tatcgaactg gtttcgacca agggcgacct ggacctcgac ggctcgggtga 60
 actgggcatac gggcaaccgg ctggggctgg gctccgcggc cgacctgacg ctgaatggca 120
 ggctgaatgc cagtggcgcc aaggctgggc tggagctgaa ggccgaaggc gctatcgata 180
 tcaatgacaa gatcgtttctc ggcggggctg gcagcgcgct ggccatggat gccggcgaag 240
 gccaccgggt gaacggcacg gcgtcggtct ccctggccgg ggccaacgcg acctacgtct 300
 ccggtggcta ttactacacg gtggtgcaga acctggcgca gttgcaggcg atcaacaaga 360
 acctggacgg cctgtacgtg ctcggcggca atatcctggg cggcagctat tactgcacgg 420
 cgctgcaatc catcggcggg cccgccggcg tcttcagcgg caccctggac ggtctcggca 480

acagcatcgg caatctctcg atcagcaaca ccgggccgaa tgcgggctg ttcgcccgt 540
cctcgggcac cctgagcaac ctgaagctga acaacctgcg ggtatccgat aacacctacg 600
gctc 604

<210> 482
<211> 412
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 482
gctttacctt gatcgaactg atgatcgtgg ttgcgatcat cggatttctt gctgccgtcg 60
ctttgccggc atatcaggat tacaccattc gtgctcgcgt gacagagggg gttggcctgg 120
ctgccagcgc caagacgctt attggcgata gctctgccac tgccggtgag ctaccgctt 180
cggcaagggt ctggaatgct caagccggta acgccggtgc taccagtaag tatgtgacct 240
ctgtacaaat tgcagagggc actggtgaaa tctactgttac tttcaatgcc gcaaactggtg 300
gtaatatcc ggctaactct accctggtat ttactcccta tgtgcagaat gctgccggtg 360
ccccgactca attgggtgcc agttatgctt ccggtgtgac tggctctatt ga 412

<210> 483
<211> 320
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 483
tgccgtgagt gaaatcagcg cgttgaagac cgctgcggag tcggcgattc tggaaggcaa 60
gaagcttggt tccaaggata atcccgcgga tggggaatat gatcttggtt ttaccaagtc 120
tactttgctt gctggcaacg acggtgaaggc acagatcacc atcactggcg aaagcagtgc 180
aaccgccacc attgcgggga ctctgggtaa ctctgctggt aaggccatca gcggtgccgt 240
tatcaccatc aagcgtagt ctgagggagt ctggacctgc gctaccagtg ggtctccggc 300
caactggaaa gccaaactacg 320

<210> 484
<211> 738
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 484
ggtatcaacc cactaaagggt ccgcaagaaa ggtatcacc tgtgggcagg gaagaagatt 60
aagcccatgg acatcgctt gtttcaactc gcagatgtct accatgatgg gtgccggcga 120

ccggtactgc aatcttttga catcatcggc gaaggattcg aaaatccaaa catgcgcaag 180
 ctagtcgatg agatcaagca ggatgttgcc gccggtaaca gcttagccag ttcacttcga 240
 aagaaacca tttacttcga tgatctctac tgcaacctgg tcgatgctgg cgaacagtcc 300
 ggtgcttttg agacattatt ggatcgggta gcaacttata aagaaaagac agaatccctg 360
 aaagccaaaa ttaaaaaagc catgacttat ccattgcag taattgtagt ggcccttgta 420
 gtatcggcga tccttctgat aaaagtggtc ccacagttcc agtccgtatt tgcaaatttt 480
 ggtgccgagt tgccggcctt tactcaaatg gtcacaaac tttccgagat gcttcaagag 540
 tgggtggctca tagtgcttat tgggtctttt gccgcagctt ttgcatttag ggaagctcat 600
 catttgggat cagtagatcg gggcctgctg aaactaccta tcatcggcgg gatactttac 660
 aaatcagcta tcgcccgcta cgcccgaacg ctatccacta cctttgcggc tggagtgcct 720
 ctggtagaag ctctggac 738

<210> 485
 <211> 740
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 485
 gaagtgaact ccgccaagga tctgaaggcg gcgctgggca tcatcgtgca gcgggtcaag 60
 gaagccatgg gtaccaggt ctgctcggtg tacctgctcg acaccgagac ccagcgtttc 120
 gtctgatgg ccaccgaagg cctcaacaag cgttccatcg gcaaggtcag catggcccc 180
 agcgaaggcc tggtcggcct ggtcggcacc cgcgaggagc cgtcaacct ggagaacgcc 240
 gccgcccacc cgcgctaccg ctatttcgcc gagaccggcg aggagcgcta cgcgtcgttc 300
 ctcggcgcgc cgatcatcca ccataggcgg gtgatggggg tgctggtggt gcagcagaag 360
 gagcgccgcc agttcgacga aggcgaggag gccttcctcg tcaccatgag cgcccagetc 420
 gccggggtea tcgcgcatgc cgaggcgacc ggttcgatcc gcggcctggg caagctcggc 480
 aagggcatcc aggaagccaa gttcgtcggc gtgcccgcg cccccggggt cggggtgggc 540
 aaggcggtag tgggtgtgac tccggccgac ctggaagtgg tgccggacaa gcaggtcgac 600
 gacatcgacg ccgagatcgc cctgttcaag caggccctgg agggcgcttc cgccgacatg 660
 cgcgcgctgt cgagcaagct cgccagccag ttgcgcaagg aagaacgcgc gctgttcgac 720
 gtctacctga tgatgctoga 740

<210> 486
<211> 680
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 486
tcgagaagtc gatgttcaag gacctcggca ttcccactcc ggattttgcg gacgtccagt 60
cccaggccga cgttgatgcc gctgcagcag ccataggcgt gccggcggtg ctcaagaccc 120
gcacactggg gtacgacggc aagggccaga aggtcctgcg ccaaccggcc gacgtgcagg 180
gcgcgtttgc cgaactgggc agcgtgccgt gcctcctcga gggcttcgtg ccgttcaccg 240
gggaagtttc gctgggtggcg gtgcgcgctc gagatgggga gacgcgttta taccctctgg 300
tgcacaacac ccacgacagc ggcatcctca agctctccgt ggccagcagc gcgcctccgt 360
tgcaggcgct ggccgaggac tacgtcggcc gtgtgctggc ccggctcgac tacgtcggcg 420
tgctggcctt cgagttcttc gaggtggacg gcggcctgaa ggccaacgag atcgccccgc 480
gcgtgcacaa ctccgggcac tggaccatcg aaggcgccga gtgcagccag ttcgagaacc 540
acctgcgcgc cgtcgcgggc ctgccgctgg gctcgaccgc caaggtcggc gagagcgcga 600
tgctcaattt catcggcgcg gtgcccccg tggtcaggt ggtcgcctgc gccgactgcc 660
acctgcatca ctacggcaag 680

<210> 487
<211> 210
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 487
agacctacaa caaggtttcg cgcttcatcc gcgagatccc gccggcgtg atccaggaag 60
tgcgctgtc caataccgtc agccgcccct acggcggcac ctgcgcagt gccggcggca 120
acctcttcag cggcgccggg gtgccggaga cgcccttctc cctcggccag cgggtgcgcc 180
acgcgctgtt cggcgaagg actatcctca 210

<210> 488
<211> 351
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 488
attcctctct gaatcgctgg aagggtttc cgccgccatg atcgccgagc tgggacgcta 60
ccggcatcag gtcttcatcg agaagctggg ctgggacgtg gtctccacct ccagggtccg 120

cgaccaggag ttcgaccagt tcgaccatcc gcaaaccgcg tacatcgctg ccatgggccc 180
ccagggcatc tgcggttggt cccgcctgct gccgacgacc gacgcctacc tgctcaagga 240
agtcttcgcc tacctgtgca gcgaaacccc gccgagcgat ccgtcggctt gggagctttc 300
gcgctacgcc gccagcgccg cgagcgatcc gcaactggcg atgaagatat t 351

<210> 489
<211> 530
<212> DNA
<213> Pseudomonas aeruginosa

<400> 489
aggaatgacg gaggcttttt gctgtggtgg cacggtttgc gttgcgagat gcagccgac 60
cacgacagcc agggcgtggt cgccgtcctg gaaaaggaag tgcggcgccct gggcttcgat 120
tactacgcct atggcgtgcg ccacacgatt cccttcaccc ggccgaagac cgaggtccat 180
ggcacctatc ccaaggcctg gctggagcga taccagatgc agaactacgg ggccgtggat 240
ccggcgatcc tcaacggcct gcgctcctcg gaaatggtgg tctggagcga cagactgttc 300
gaccagagcc ggatgctctg gaacgaggct cgcgattggg gcctctgtgt cggcgcgacc 360
ttgccgatcc gcgcgccgaa caatttgctc agcgtgcttt ccgtggcgcg cgaccagcag 420
aacatctcca gcttcgagcg cgaggaaatc cgctgcggc tgcgttgcat gatcgagttg 480
ctgaccaga agctgaccga cctggagcat ccgatgctga tgtccaaccc 530

<210> 490
<211> 569
<212> DNA
<213> Pseudomonas aeruginosa

<400> 490
ttcaacctca acggaactgg gcgcaagcgc aaggtcaagc cggactcggg gaagcagttc 60
cgtcgccctgc tggccaccct ggggatgaag gaagagatcg tccagggctt gccggaccgg 120
ctggccgact ggctcgacgc cgaccagaat ccgcagggcg agcaaggcgc cgaggacaac 180
cagtacctgc tggaggcgcc ggcctaccgc gccgccaacc gcagtttcaa ggacgtgtcc 240
gagctgcgcc tgctgaaatt gtcggaagcc gactatcgac gcctgctgcc gttcgtcagc 300
gccttgcccg aagatgcgcc gctgaacgtg aacactgccg gcgtgccggg gctggccgcc 360
atgttcgaga tcgatccggg acaggcgga aacatcgtag acgcccgcgg tcgggaaggt 420
ttccagagca aggacgattt caccaagcat ctgaccaggt tgggttcgaa gaccggaac 480

gtcagttatg ccgtcggcac ccgtacttc caggtgatca gcgaggtcag cctgggcgac 540
cgccggcagg tgctggtgag taccttgca 569

<210> 491
<211> 345
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 491
cattgaaagg tcgtagcgat gcgtataccc aggtagacaa cttcctgcat gcctatgcgc 60
ggggcgggga cgaattggtc aatggccatc cgtcctatac cgtcgaccag gcggcgggagc 120
agatcctccg cgaacaggcg tcttggcaga aagcgccggg cgactcggtg ctgaccctgt 180
cctattcggt cctgaccaa ccgaacgact tcttcaatac gccgtggaag tatgtcagcg 240
atatctactc gctgggcaag ttcagcgct tttccgcgca gcagcaggcc caggccaagt 300
tgtcgtcgca atcctgggtcg gacgtcacca atatccactt cgtcg 345

<210> 492
<211> 576
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 492
ggtcaagcac atcctagtgc gcgacggcca gcatgtggag gcgggcgagc cgctgatccg 60
catggaaccg acccaggccc gggccaacgt cgattcgctg ctcaaccggt acgccaacgc 120
gcgggtcaac caggcgcgcc tgcaggccga atacgacggc cggcggaccc tggagatgcc 180
cgcggggctg gccgagcagg ccccgtgcc gaccctcggc gagcgcttg agttgcagcg 240
gcagttgctg cacagccgcc agaccgcgct ggccaacgaa ctctccgcat tgcgggcgaa 300
catcgagggg ctgcgcgccc agctcgaagg gttgcgccag accgagggca accagcgct 360
gcaacaacgc ctggtgaaca gccagttgag cgggtcgcgc gacctcgccg aggaaggcta 420
catgccgcgc aaccagttgc tcgaacagga gcgccaactg gccgaggtga acgcccggct 480
atcggagagc agcggctcgt tcgggcagat ccgccagagc atcgccgagg cgcagatgcg 540
catcgcccaa cgcgaggagg agtaccgcaa ggaagt 576

<210> 493
<211> 581
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 493
 ccgaaggact tggtttactc caactttgtg cagcaggacg gcggtagcac cctgttggg 60
 cagtacgaca tgatcaacga aggcagccaa gtgattgaac ttgccgtcaa cttgcaacaa 120
 gggtttagtg acaccttcac ctggagcgtc actgagcagt tgaaggtcgg tgtggaagtc 180
 aaggtgaagg cgaacattcc cctagtgggc ggcgctgaga tcaccagtac ggtggaattg 240
 tcaactgtcct ctacccaagg ggcgagtacc agcaagtctt ccaactatgg cgcctctacc 300
 aaggtgctta tttccccaca tagccacggc tggggagagg ttgccttgag ctttactgag 360
 ctgcgcactc agtgggtcgg taatgtcggg cttcaaggat atgtggcaat ttggttcaac 420
 aacaaagtcg cattgaacaa cgatggcgat taccactacc tgtggttcat tcccgaggag 480
 caggtatttt gggagtgcgt ccagcacaac atagtcaata cctcgggcta tgcgtacaa 540
 ggcaatggag tgttggcgca agccacaggc accttcata g 581

<210> 494
 <211> 457
 <212> DNA
 <213> Pseudomonas aeruginosa

<400> 494
 cactttccgt tattgcctcg aagacgaagg ctacagcgtg gccaccgcca gcagcgcgcc 60
 gcaggcggag gccctgttgc agcgccagggt attcgacctg tgettcctcg acctgcgcct 120
 gggcgaagac aacgggctcg acgttctcgc ccagatgcgc gtccaggcgc catggatgcg 180
 cgtggtgata gtcaccgcgc attcggcggg ggataccgcg gtcgatgcca tgcaggccgg 240
 cgcggtggat tacctggtca agccctgcag cccggaccaa ctgcgcctgg ccgcccga 300
 gcaactggag gtgcgccaac tgaccgcgcg cctggaggcc ctggaggacg aagtgcgccg 360
 ccagggcgac ggcctggaat cgcacagccc ggccatggcc gcggtactgg agaccgcgcg 420
 ccaggtagcg gcgaccgacg ccaacatcct catcctc 457

<210> 495
 <211> 289
 <212> DNA
 <213> Pseudomonas aeruginosa

<400> 495
 gactggctga atcgtctcgc cgaggccgat cgccagaaca gtttccaagg caccttcgtc 60
 tacgagcgca atggcagctt ctccacccat gagatctggc atcgcgtgga gagcgatggt 120

gcggttcgcg agcgctgct ccagctcgac ggcgcgcgcc aggaagtggc ccgggtcgac 180
gggcgcaccc agtgcacag cggcggcctt gccgaccaac tggccgatgc ccagctgtgg 240
ccgggtcgca agttcgatcc ctcccagctg gtttcctggc acgacctgc 289

<210> 496
<211> 659
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 496
attgtcgatg acgaacctct ggcgcgagag cgcctggccc gattggtagg gcaactggac 60
ggctatcgcg tcttcgagcc ctccggccagc aatggcgaag aagcgtgac gctgatcgac 120
agcctcaagc ccgatatcgt cctgctggat atccgatgc ccggtctgga cggcctccag 180
gtcgcggcca gactctgca ggcggaagcg ccgccggctg tgatcttctg cacggcccat 240
gacgaattcg ccctggaagc cttccaggtc agcgcctggg gctacctggc caagccggcg 300
cgcagcgaag acctggccga ggcgttgaag aaagcctcgc gaccgaaccg cgtgcaactg 360
gccgcgctga ccaagccccc ggctccgggc ggcagcggtc cgcgcagcca catcagtgc 420
cggacccgca aggggatcga gctgatcccg ctggaagagg tgatcttctt cattgccgac 480
cacaagtacg tgaccttgcg ccatgcgcag ggcgaggtgc tgctggacga gccgttgaag 540
gcgctggaag acgagttcgg cgagcgcttc gtgcgcatcc accgcaacgc gctggtcgcc 600
cgcgaacgga tcgaacgect gcagcgtaag ccgctggggc atttcagct ctacctgaa 659

<210> 497
<211> 629
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 497
cgtttgggac agattgaggc ccgccaggtc gccaccccca gtgaagcgca gcagttggcc 60
cagcgcagg acgcgccgaa gggtagggg ctgctcgctc gcctgggcgc ggcgctcgtg 120
cgtccgttcg tggcgatcat ggactggctg ggcaaactgt tgggctccca cggccgaccc 180
ggcccgcagc ccagtcagga cgcgcagcct gcggtcatgt cctcggccgt cgtgttcaag 240
cagatgggtgc tgcagcaggc attgcccagc acctgaagg gactcgacaa ggcgagcgag 300
ctggcgaccc tgacaccgga aggactggcc cgggagcact cccgcctggc cagcggagat 360
ggggcgctgc gttcgctgag caccgccttg gccggcatte gtgccggcag ccaggtcgag 420

gagtcccgtg tccaggctgg ccgctgctc gaacggagca tcggcgggat cgcgctgcag 480
 cagtggggca ccaccggcgg tgccgcgagt caactggtgc tcgacgcaag cccggaactg 540
 cggcgcgaaa tcaccgacca gttgcatcag gtaatgagcg aggtcgcaact gttgcgcca 600
 gcggtagaga gcgaggtcag cagagtatc 629

<210> 498
 <211> 332
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 498
 aatgcgataa ccatcagcgt cggcgaggcg gcggacagca gcgtcgatct cggcgccacc 60
 atgatcacct ccaaccagtt gggcaccatc accgaggaca gcggctccta tacgccaggc 120
 actatcgcca cggcgaccgg cctggtcctg actccgcgcg agacgcccc a gtcgatcacc 180
 gtggtcaccg gccagaacat ggacgacttc ggctcaaca acatcgacga cgtcatgcgc 240
 catacgcccg gcataccagt ctcggcctac gacactgacc gcaacaacta ctatgcccgc 300
 ggcttctcga tcaacaactt ccagtacgac gg 332

<210> 499
 <211> 456
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 499
 ctgggacggt agtgtcatcg acgagatgga aatcgatggt tatgacgcac tcagtcctta 60
 ttacatgttg atccaggaag atactcctga agcccagggt ttcggttgct ggcaattct 120
 cgataccact ggcccctaca tgctgaagaa caccttcccg gagcttctgc acgcaagga 180
 agcgccttgc tcgccgcaca tctgggaact cagccgtttc gccatcaact ctggacagaa 240
 aggctcgtg ggcttttccg actgtacgct ggaggcgatg cgcgcgctgg cccgctacag 300
 cctgcagaac gacatccaga cgctggtgac ggtaaccacc gtaggcgtgg agaagatgat 360
 gatccgtgcc ggctggacg tatcgcgctt cggccgcac ctgaagatcg gcacgagcg 420
 cgcggtggcc ttgcgcatcg aactcaatgc caagac 456

<210> 500
 <211> 275
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 500
aagaagtctc tgctccccct cggcctggcc atcgggtctcg cctctctcgc tgccagccct 60
ctgatccagg ccagcaccta caccagacc aaatacccca tcgtgctggc ccacggcatg 120
ctcggcttcg acaacatcct cggggtcgac tactggttcg gcattcccag cgccttgcgc 180
cgtgacggtg cccaggtcta cgtcacgaa gtcagccagt tggacacctc ggaagtccgc 240
ggcgagcagt tgctgcaaca ggtggaggaa atcgt 275

<210> 501
<211> 648
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 501
atggcagttt cagtgtcgac gccagcggca acctgctgat caccgcgac atccgcaacc 60
tgttcgacta cttctcage gccgtcggcg aagagcccct gcagcaaagc ctggaccgcc 120
tgcgcgcta catcgccgcc gaactccagg agccgcgcg cgccaggcg ttggcgctga 180
tgcagcaata catcgactac aagaaggaa tggtgctgct cgaacgcgac ctgccgcgcc 240
tgcccgacct cgacgccctg cgccagcggg aagccgcggt gaaagccctg cgcgcgcgga 300
tcttcagcaa cgaagcgac gtggcgttct tcgccgacga ggaaacctac aaccagttca 360
ccctggagcg cctggcgatc cgccaggacg gcaagctcag cgccaggaa aaggccgcg 420
ccatcgaccg cctgcgcgcc agcctgccgg aagaccagca ggaaagcgtg ctgccgcaac 480
tgcaaagcga actgcagcag cagaccgccg cctccaggc cgctggcgcc ggcccgaag 540
ccatccgcca gatgcgtcag caactggtgg gcgccgaag caccaccgc ctggagcaac 600
tcgatcggca acgctcggcc tggaagggcc ggctggacga ctatttcg 648

<210> 502
<211> 405
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 502
aatgtcggca tcattctcgc caacgaggcg gggcaggtgc tgtgggcgcg gcgtatcaat 60
caggaagcct ggcagttccc gcaggaggc atcaatgatc gcgaaacgcc ggaagaggcg 120
ctgtatcgcg aattgaacga agaagtcggg ctggaggccg gggacgtcg catcctggcc 180
tgcaccgcg gctggctcg ctaccgtttg ccgcagcgcc tggcgcgac ccacagccag 240
ccgctgtgca tcggccagaa gcagaaatgg ttctgctgc ggctgatgtc cgacgaggcg 300

cgcggtgcgca tggatatcac cagcaagccc gagttcgacg gctggcgctg ggtgagttac 360
 tggtagcccc tgggacaggt ggtgaccttc aagcgcgagg tctac 405

<210> 503
 <211> 542
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 503
 gacctgctgt tccagttgct cggctatctg gccaaagacg gcgggcgggt ggaggagatg 60
 catatccgcc aggcgcgcga ggagatggcg ttgcgcaagc tcgataggcg agcccagcgg 120
 cgtgccatcg cgtccttcgg caagggaag gccggcatcg cccatctgca ggcgagagtc 180
 gcgcgtctga agggcgaacg tgcggaggca gtattgctcg cctgctggcg gatggcctgg 240
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 ggttggtcgg cggagcgaac ggaacgcttg tcggcgcggg tcatgccga gcggacgcgc 360
 gctgtcgcgc gggatagcta ccgtgaggcc ctgctgctgc tcggcgtgga ggccggaagc 420
 gagccggcgc tgatcaaacg cgcctatcgc aagctgatca gccagcatca tccggacaaa 480
 ctggcgggag ccggcgccag cgtcgagcgc gtgcgtgcgg ctaccgagaa aaccctgaa 540
 tt 542

<210> 504
 <211> 427
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 504
 cctgctcaac accttctatc cgcagttgcc ggcggtggcg cgtttcatcg aactgggccc 60
 ccagttgcac caccggcgcg gcatccgcca cctggacgcg gcctgcgggg tgcaggtcgg 120
 ttccgccacc ctggacatcc tcgcgcggtt gctggagggc gtcggccctt ggtcgtgga 180
 gtcgccctcg aacgacctgt cggcgatgcg cgggctgtcc ctggtgttg cggaagtgcc 240
 gttgagcctg cacgtgctca acgaactggc ggccgccgac gatgggcgca tgacctgtt 300
 gcagcgcgtc agcctgacca ccgatcgcg cagctgagc ctgctcagcc cccatggccc 360
 gttgtgtgg acgcctgcgg tggcggtagc ggcagaggat gacgacggcc tgttcgcgtt 420
 gttcgac 427

<210> 505
<211> 417
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 505
gttgaagggt tttaccgaca acctggaatt gcggcggcgc aaccgtgccca cggtcgagca 60
ctacatgcgc atgaaggggg ccgaacggtt gcagcggcac agcctgttcg tcgaggacgg 120
ctgcgccggc aactggacca cggaaagcgg cgaaccctg gttttccggg gccatgagag 180
cctcaggcgg ctgcgccagt ggctcgagcg ctgcttcccc gactgggagt ggcacaacgt 240
gcggatcttc gagaccgagg atccgaacca cctctgggtc gagtgcgacg ggcgcggcaa 300
ggcgtggtc ccgggggtatc cgcagggtta ttgcgagaac cactacatcc attccttcga 360
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<210> 506
<211> 356
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 506
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cttttcgtcg aggacggtg tggcggttta tggaccacg ataccggctc gccatcgtc 180
attcgtggca aggacaagct ggccgagcac gcggtgtggt cgctgaaatg cttcccgat 240
tgggagtggg acaacatcaa ggtcttcgag accgacgac ccaaccactt ctgggtcgag 300
tgcgacggcc acggcaagat cctcttcccc gggatatccg agggttacta cgagaa 356

<210> 507
<211> 671
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 507
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cgtcccgcag agcgacgcgc gcaaggagga cgcctactgg cagcagttct accggcccag 120
tcccaaatac tggctctacg agcccaagag cctgccccgc caggaaaagg gccagcggcc 180
taccctcgcg gtgccctacc agttgcacgc cacgctggcc ctcgacatcg ccgccggcaa 240
gctgcgcctg accctgggca acgacggcat gagcctgccg ggcaatccgc aggacactgc 300

cgctgcggta ttccaggtgc agccgcggga agtcggcaat ccgcgcttct ataccgtgac 360
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 cgacgacctg ctcgacgcca acggccgcta cgccttcgag gtgcacggcc ccaacggctt 480
 cttccgcgag ttccacggca acctgcatct cgccgcgcag atggcgcggc ccgaggatc 540
 ggtcacctat caacgcaacg gcaacctgca gttgaacatc cgcaatctcg gccgcctgcc 600
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 actcgaaccg a 671

<210> 508
 <211> 304
 <212> DNA
 <213> Pseudomonas aeruginosa

<400> 508
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 gtgcacggtc cgaacggttt cctccgggtc ttctcgggca acctgcggcg cgacctggcg 180
 gacggcaagg cgccgtgcc ggaagtgcgg atcgactacg agccgtgtt cggcaacctg 240
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 tate 304

<210> 509
 <211> 302
 <212> DNA
 <213> Pseudomonas aeruginosa

<400> 509
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 aacgcaagca ggccgccgaa ggtctgatcg aacagctcaa gcgcgaggtg gcggtcggcg 120
 ccgatccgcg ccagaccttc gaggagatcc agcgtctgac gccctatgtg gaggccgatg 180
 ccaggcgcgg cgaggcgctc gacttcgaga tctggatggc gctcaaggac aacgcctccg 240
 tccagcagca agcgccgacg cctggcgagg aagagcaact gcggaatac gcgcaagagt 300
 cg 302

<210> 510
 <211> 722
 <212> DNA

<213> *Pseudomonas aeruginosa*

<400> 510

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ctggcgggat ggtcgctcgg cggcaacctg gcgatggatg tcgcggcccg gctggagcag      180
cgtgggcggc aggtggcttt cgtcggctgg atcgatgcac cggcaccggt cagggtcgaa      240
gcgttctgga acgagatcgg gccgacgcgg gaggcagtcc cgaacctatc cgtgggcgag      300
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tggtcatcga tctgctccgc caccacggac gatgagcagc gctggacgag gatgagcgcac      420
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gattacccgc gtctgacggc gaaggtcagc ctctggtggg ccgcgcgcag caccaatgcc      600
atccagcggg gcgcggtgga gcgctcgatg gccgagcgga tcggggctga gcgtgtcgaa      660
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<210> 511

<211> 616

<212> DNA

<213> *Pseudomonas aeruginosa*

<400> 511

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aaggactacg gtttcgccta tcgtcccggg cagcaatggt tctatccggc agacctgcag      180
gtgcaaggca agaccctgaa cgacctcttg ctcagcgtgc cgtccaccta ccgtcggtag      240
ccgcggggta ccccgagca tgtggccggc aagagcgatt tcgagcgacg cctgcatgac      300
accctggttg agctgggcgc cgatgtggtg gtattggacg ggctcctggt catcctcgat      360
gagctggtac gcccgggcgc tccgttcgca cggcgatca tgaatatcca tcctggcgtg      420
acgcgcgagg actcgcctta cgagcgtcgt ggcgcctatg cgaccctgga cgcgttgat      480
ggagcgcggg gcgagaaggt ggtggattgg gcgaccatgg aaaaggtcgc ggtcgagccg      540
ctgtactgga ccggagcact cgttcactat gtggacaatg gcatcgattc cggcgaagtg      600

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ttccatgatg tgctga 616

<210> 512
<211> 741
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 512
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gctgatgccg ctcttggtcc ggcaaagaat cttgcacccat tggacgtcat caaccgcagt 120
ctgaccatcg ttggaaacgc cctccagcaa aagaatcaaa aactactgct gaatcagaag 180
aagattacca gcctgggtgc aaagaatttc cttacccgta cggcgggaaga gatcggtgaa 240
caagcgggtgc gagaaggcaa tattaacggg cctgaagcct atatgcgctt cctcgacagg 300
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cagcaagcgg cgataagagc tgccaatacc tatgccatgc cggccaatgg cagcgttgtc 540
gccaccgccg caggccgggg tctgatccag gtcgcacaag gcgccgcac ccttgctcaa 600
gcgatctccg atgcgattgc cgtcctgggc cgggtcctgg cttcagcacc ctcggtgatg 660
gccgtgggct ttgccagtct gacctactcc tcccggactg ccgagcaatg gcaggaccaa 720
acgcccgata gcgttcgtta c 741

<210> 513
<211> 211
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 513
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gttccctacc gaggagtctc atattcaagc cgtgcttgaa tttaaaaaac taacggaaca 120
cccaagcggc tcagaccttc ttactacco caacgaaaat agagaagata gccagctgg 180
agttgtaaag gaagttaaag aatggcgtgc t 211

<210> 514
<211> 589
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 514
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 agccgaaaat tctatggaga gttcctggat cgccatatga gtgagctggc caaagcgtac 120
 agcgccgata tctataaggc gcaaatcgct atcttgaaac aaacgtctca agagctggag 180
 aataaagccc ggtcattgga agcagaagcc cagcgagccg ctgctgaggt ggaggcggac 240
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 aatgctttgc ctcaactgac caatccaacg ccagagcagt ggcttgaacg cgctactcaa 360
 ctggttacgc aggcgatcgc caataagaag aaattgcaga ctgcaaacia tgccttgatt 420
 gccaaaggc ccaatgcact ggagaaacia aaggcaacct acaacgccga tctcctagt 480
 gatgaaatcg ccagcctgca agcacggctg gacaagctga acgccgaaac ggcaaggcgc 540
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<210> 515
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 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 515
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 tcccattcag aactcaagaa aaacctgaaa aatgaaaccc tgaaggaggt tgatgaactc 180
 aagagtgaag cggggttgcc aggtaaagcg gtcagtgcc atgacatccg cgatgaaaag 240
 agtatcgttg atgactcat ggatgccaaa gcaaaatcgc taaaggccat tgaggatcgc 300
 ccggccaatc ttatatacggc ttcagacttt cctcagaagt cagagtcgat gtaccagagt 360
 cagttgctgg ccagccgaaa attctatgga gagttcctgg atcgccatat gaggagctg 420
 gccaaagcgt acagcgccga tatctataag gcgcaaatcg ctatcttgaa acaaacgtct 480
 caagagctgg agaataaagc ccggtcattg gaagcagaag cccagcgagc cgctgctgag 540
 gtggaggcgg actacaaggc caggaaggca aatgtcgaga aaaaagtgc gtccgagctt 600
 gaccaggctg ggaatgcttt gcctcaactg accaatccaa cgccagagca gtggcttgaa 660
 cgcgctactc aactggttac gcaggcgatc gccaaataaga agaaattgca 710

<210> 516
 <211> 752
 <212> DNA

<213> Pseudomonas aeruginosa

<400> 516

| | |
|--|-----|
| tcgccaataa gaagaaattg cagactgcaa acaatgcctt gattgccaag gcaccaaatg | 60 |
| cactggagaa acaaaaaggca acctacaacg ccgatctcct agtggatgaa atcgccagcc | 120 |
| tgcaagcacg gctggacaag ctgaacgccg aaacggcaag gcgcaaggaa atcgctcgtc | 180 |
| aagcggcgat cagggctgcc aatacttatg ccatgccagc caatggcagc gttgtcgcca | 240 |
| ccgccgcagg ccggggtctg atccaggctg cacaaggcgc cgcattccctt gctcaagcga | 300 |
| tctccgatgc gattgccgtc ctgggccggg tcttggttc agcaccctcg gtgatggccg | 360 |
| tgggctttgc cagtctgacc tactctctcc ggactgccga gcaatggcag gaccaaaccg | 420 |
| ccgatagcgt tcgttacgcc ctgggcatgg atgccgctaa attggggctt ccccaagcg | 480 |
| taaacctgaa cgcggttgca aaagccagcg gtaccgtoga tctgccgatg cgcctgacca | 540 |
| acgaggcacg aggaacacg acgacccttt cggtggtcag caccgatggg gtgagcgctc | 600 |
| cgaaagccgt tccggtccgg atggcgccct acaatgccac gacaggcctg tacgaggtta | 660 |
| cggttccctc tacgaccgca gaagcgccgc cactgatcct gacctggacg ccggcgagtc | 720 |
| ctccaggaaa ccagaaccct tcgagtacca ct | 752 |

<210> 517

<211> 739

<212> DNA

<213> Pseudomonas aeruginosa

<400> 517

| | |
|---|-----|
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| ggctgggggg gggcgatgct ggggtgcagg tctggcggtg cactgtagg gttcctggat | 120 |
| gacatgggc acattgctgc gcgttggcgg ctgctcggcc atttctcagc agcgatatgg | 180 |
| atcttgctgt ggacgggtgg tttcccgccg ctggatgtgg ttgggcatgc tgcgactta | 240 |
| ggatggctgg gccacgtatt ggcagttttc tatttggtat ggggtctgaa cttttataac | 300 |
| ttcatggatg gcattgatgg tattgccagt gtcgaggcca ttggtgtctg tgtaggaggg | 360 |
| gccctgatct actggcttac agggcatgtc gcgatgggtg gtatccctct gttgctggcg | 420 |
| tgcgcggctg ccggcttcct gatctggaac ttccctccag ctogaatctt catgggtgat | 480 |
| gcggggagtg gttttcttgg tatggttatt ggtgcactag ctattcaggc tgcatggacc | 540 |
| gccccctcgc tgttctgggtg ctggttgata ttgctgggag tgttcacgt tgatgcaacc | 600 |

tataactctga tccgccggat cgccagaggg gagaaattct atgaggcgca tcgcagccac 660
gcttatcagt ttgcctcgcg tcgttatgct agccatctgc gggttacctt ggggtgttctg 720
gctatcaaca ctctttggt 739

<210> 518
<211> 756
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 518
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cccgggcgca gcacggtgat gctggtcaac ggcgcgatgg cgaccaccgc ctcgttcgcc 120
cggacctgca agtgccctggc cgaacatttc aacgtggtgc tgttcgacct gcccttcgcc 180
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ctggcttgcc tggagcggat ccagagccac gtgcatttca tcaacggcag ctgggacgaa 660
tacaccacgc ccgaggacgc ccgccagttc cgcgactacc tgccgcactg cagtttctcg 720
cgggtggagg gcaccgggca tttcctcgac ctggag 756

<210> 519
<211> 473
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 519
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tgcagggcga cttctacgcc atggccctgc gcgcgctgga acgcctcggc gcgcgtggga 120
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cccacgacca gttcgacaat gccgaacggc tggctccggct cggctgcggg atgcgcctgg 360
 gcgtgccatt gcgcgagcag gagttgcgcg gggcgtgtg gcgcttgctc gaggacccgg 420
 ccatggcggc ggcctgtcgg cgtttcatgg aattgtcaca accgcacagt atc 473

<210> 520
 <211> 459
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 520
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 gtggatccgg cgatcctcaa cggcctgcgc tcctcggaaa tggtggtctg gagcgacagc 180
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 cagcagaaca tctccagctt cgagcgcgag gaaatccgcc tgcggctgcg ttgcatgac 360
 gagttgctga cccagaagct gaccgacctg gagcatccga tgctgatgtc caaccgggtc 420
 tgcttgagcc atcgcgaacg cgagatcctg caatggacc 459

<210> 521
 <211> 519
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 521
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 aaggggcgaa aatcaaggat ctgattaagc gctatcagta tattggttcg caaatcccgg 120
 cagcaatcat gattcgtggc gtgcaggaag agatcaaaaa atccacgaac actgccttgg 180
 ccaatgtggg ggcaattgtc gatggcgaac tggcgtatct tgctagccag aaaaaggaaa 240
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 tctttggcta tgacctctc acggtaatt atgttaatgt aatgaatgaa atctacggcc 420
 gccgcgaaga taaagatttc agtttcgaca actggctgaa gtcttattca gccgcacaaa 480
 agatccgctt gatcgaagcg aaaatcagcg tcctcaata 519

<210> 522

<211> 417
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 522
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 cagctcagcc acatgtcgcc gatctacacc atcgagatgg gcgacgagtt gctggcgaag 180
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 aagcgtgga gcgaatgggc cagcggcaag gtgttgtgcc tgctcgaccc gctggacggg 360
 gtctacaact acctcgcca gcagcgtgc aacctcgacg atacctggga aggcaag 417

<210> 523
 <211> 573
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 523
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 ttaattacga cagataatcc aggttgcaaa gaaattgtta aagatagaga gacaggctat 480
 atatttcaag ggggaaatgt tgaggaacta gtctctatat tggaagtttt ttaggtcta 540
 gaaaatgaaa aacgaaaaga gatgggactt caa 573

<210> 524
 <211> 535
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 524
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atctaagtct aaattaatct taggaaaaaa gattagagta aacgccgggg gagtattgaa 180
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 gatagcttgt cgtaaaataca tagatattaa atctggagta aaatgtgggc ctggagtact 300
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 gacggcccca gttatgattg gagaaaatgt ttggattgga gctaacagca ttgtcttgaa 420
 gggagtgagt attggtgaga atagtgtggt tgcagcagga agtgttgtaa caaaggatat 480
 tccagctgat actatattta ttcagaaacg tttatcaagg gagatgaaat tatga 535

<210> 525
 <211> 691
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 525
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 ttctatattg tcaaaataaa aataagatta ttgaaggaat gattgatagc gacttaatag 180
 ttgttcgtat tccgtctata attggatcaa aaactgcaga ctacgcattg aagataggta 240
 agccgtatct gacagaaata atgggggatg cttgggattc ttactgggat catagtttaa 300
 agggaaaatt attagctcca tatatatacg caaaaactaa atcaattgta aaaaacgcta 360
 attattgcat atacgtgaca gaaaaatatt tacaagatag ataccctaatt attaaatcta 420
 atatcgttgc ttcaaatggt aatattacct ctgtagagaa tagatctttg aagagccgtc 480
 tttataagtt gaaaaaattt aatcctcaaa aaatttcaat aatgacaaca gcatctgtga 540
 atgtacgagc caagggccat agatttgtat tggaagcaat gaagagatta gaaatacaag 600
 gtattttgtt ggattattat ttagcagggt atgggtgatca aagtttctta aaaaagaaag 660
 cagaggaatt gggagtagcg aatagaatcc a 691

<210> 526
 <211> 509
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 526
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 acttaaagggt ggagctatta aggaagagggt tccgatactg gttgttgctt ttaatgaagc 120

agagggttgca aaattgttta gtaacactta cttggcaact cgcgtacggt attttaatga 180
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 cttaccaaaa gacacaaaagc aattgaaaagc aagtttttagg gatgttcctg aaaatctgat 360
 tacagctgtg gtgcaatcta ataaaacaag aaaagattat atagctggag ctattctagc 420
 taaacaacct agtgtttagt gtatttatag attaattatg aaatctgatt ctgataattt 480
 tcgttctagt gctgttaagg gagttatgg 509

<210> 527
 <211> 695
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 527
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 gttattacac tcctgttcct ggcaagagaa atgctatcct ctttgggctg gagcatgtgg 180
 attcgagag tgatattaca gttctagtag atagtatac agtatggacg cctagaacct 240
 tgagtgtgtt gctgaagcct tttgtttgag ataaaaaat aggtggggta acgacaagac 300
 aaaaaattct tgacctgag cgtaatctcg tgacaatgtt tgctaacttg ttagaggaaa 360
 ttagggcaga aggaactatg aaagcaatga gtgtgactgg taaagtaggg tgcttacctg 420
 gtcgaacaat tgcttttaga acagagatto tcagagagtg tatacatgag tttatgaatg 480
 agactttcat gggatttcat aaggaagttt ctgatgatag aagtcttaca aatttgactt 540
 taaaaaaagg ctataaaact gttatgcagg atacttctgt tgtgtatata gatgctccta 600
 caagttggaa aaagttcatt agacagcaac taaggtgggc agaaggttct cagtataaca 660
 atctaaagat gactccttgg atgattagaa atgcc 695

<210> 528
 <211> 542
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 528
 tcgtcatctg tactgggtctg ggcttgcttg taggaggatt tttcctgcta aaaccagctc 60
 cacaaacacc tgtcaaagag acgaatttgc aggtgaagt cgcagctgtt tccaaggatt 120

| | |
|--|-----|
| tggtatccga aaaggaagtg aacaaggaag aaaaggaaga accccttgaa caagatctaa | 180 |
| tcacagtaga tgtcaaaggt gctgtcaaatt cgccagggat ttatgacttg cctgtaggta | 240 |
| gtcgaatcaa tgatgctgtt cagaaggctg gtggcttgac agagcaagca gacagcaagt | 300 |
| cgctcaatct agctcagaaa gttagtgtg aggctctggt ttacgttcct actaaggag | 360 |
| aagaagcagt tagccaacag actggtttgg ggacagcttc ttcaataagc aaggaaaaga | 420 |
| aggtcaatct caacaaggcc agtctggaag aactcaagca ggtcaaggga ctgggaggaa | 480 |
| aacgagctca ggacattatc gaccatcgtg aggcaaatgg caagttcaag tcagtagacg | 540 |
| ag | 542 |

<210> 529
 <211> 545
 <212> DNA
 <213> Streptococcus pneumoniae

| | |
|---|-----|
| <400> 529 | |
| gtggaaatct gctggtaaag ttctaataat ttgcggaatc tttggatttt ggtttgtttt | 60 |
| tcaaaattgg caacagagtc aagcgagtca aaatctggcg gattctgttg aaagggtacg | 120 |
| gattctgcct gacactgtta aggtcaatgg tgatagtctg tcctttcgcg gcaaggctga | 180 |
| tggacgcatt tttcaagtct attataaact ccagtccgag gaggagaaag aagcctttca | 240 |
| agctttaacc gacctgcatg agataggact agaagggaag ctttcggagc cagaagggca | 300 |
| gagaaatttt ggtggcttta attaccaagc ctatctgaag actcagggaa tttaccagac | 360 |
| tctcaatata aaaaaaatcc agtcaattca aaagattggc agttgggata taggagaaaa | 420 |
| cttgtccagt ttacgtogaa aggctgtggt ttggattaag acgcactttc cagaccctat | 480 |
| gcgcaattac atgacaggac tcttgctggg acatctggac accgactttg aggagatgaa | 540 |
| tgagc | 545 |

<210> 530
 <211> 402
 <212> DNA
 <213> Streptococcus pneumoniae

| | |
|---|-----|
| <400> 530 | |
| gattatcggg gaaattcgtg acagcgagac ggcgctgca gtggtcagag ctagtgtgac | 60 |
| aggtgcgaca gtcttttcaa ccattcacgc caagagtatc cgaggtgttt atgagcgtct | 120 |
| gctggagttg ggtgtgagtg aagaagaatt ggcagttggt ctgcaaggag tctgctacca | 180 |

gagattaatc gggggaggag gaatcgttga ctttgcaagc agagattatc aagaacacca 240
agcagccaag tggaatgagc aaattgacca gcttcttaaa gatggacata tcacaagtct 300
tcaggctgag acggaaaaaa ttagctacag gctaagcaaa aaaatatcat caccctatct 360
aacaatctct tttctagcgg ttttcatctg gtggagacta tc 402

<210> 531
<211> 463
<212> DNA
<213> Streptococcus pneumoniae

<400> 531
tggacaagca gtgtgtgacc cagatgcgtg tgggcttgtc tcaggggaaa tcattctcag 60
aatgatgga aagtttgga tgttcaagtg ctattgtcac tcagttatcc ctagctgaag 120
ttcatggcaa tctccacctg agtttgggaa agatagaaga atatctggac aatctggcta 180
aggtaagaa aaaattgatt gaagtagcga cctatccctt gattttgctg ggttttcttc 240
tcttaattat gctggggcta cggaattacc tgctccaca actggatagt agcaatattg 300
ccacccaaat catcggaat ctgccccaaa tttttctagg catggtaggg cttgtttccg 360
tgcttgccct tttagcactc actttttata aaagaagttc taagatgagt gtcttttcta 420
tcttagcacg ccttcccttt attggaatct ttgtgcagac cta 463

<210> 532
<211> 322
<212> DNA
<213> Streptococcus pneumoniae

<400> 532
aaaaatgatg acattcttga aaaaagctaa ggttaaagct ttacattgg tggagatgtt 60
gggtgtcttg ctgattatca gcgtgctttt cttgctcttt gtacctaatac tgaccaagca 120
aaaagaagca gtcaatgaca aaggaaaagc agctgttggtt aagggtgttg aaagccaggc 180
agaactttat agcttagaaa agaatagaaga tgctagccta agaaagttac aagcagatgg 240
acgcatcacg gaagaacagg ctaaagctta taaagaatac catgataaaa atggaggagc 300
aaatcgtaaa gtcaatgatt aa 322

<210> 533
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 533
 atgctggaaa gtctcttggg tttgggactt gtgagtatcc ttgccttggg cttgtccggc 60
 tctgtccagt ccactttttc agcggtagag gaacagatth tctttatgga gtttgaagaa 120
 ctctatcggg aaacccaaaa acgcagtgtg gctagtcaac aaaagactag tttgaacttg 180
 gatgggcaga tgattagcaa tggcagtcaa aagttgacag ttcctaaagg aattcaggca 240
 ccatcaggcc aaagtattac atttgaccga gctgggggca attcgtccct ggctaagggt 300
 gaatttcaga ccagtaaagg agcgattcgc tatcaattat atctaggaaa tggaaaaatt 360
 aaacgcatta aggaaacaaa 380

<210> 534
 <211> 547
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 534
 ggctgtagga gacaatgaag ttcgtctctt gtctttgctt gagattgcca gtcaacgtag 60
 cagtctggtg attttgacag gcggtttggg ggcaactgag gacgacctaa ccaaacaac 120
 cctagctaaa tttttaggga aagcattagt ctttgatcct caggctcagg agaagttgga 180
 tatctttttt gccctgcgac cagactatgc ccgaacaccg aataacgaaa gacaagctca 240
 aattgtagaa ggagcgattc cactgccaaa cgaaacagga ctggctgttg gaggaaaatt 300
 agaagtagac ggagtgcct atgtcgtcct tccaggtcg ccaagtgaat tgaaacccat 360
 ggtcttaaac caacttctac ccaagttgat gacagggagc aagctgtatt cccgagttct 420
 tcgtttcttt gggattggcg agagccagtt ggttacgatt ttggctgatt taattgataa 480
 tcagatcgat cctaccttgg ccccttatgc caagacagga gaagtcactc tacgtctgtc 540
 aacaaag 547

<210> 535
 <211> 520
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 535
 ttgtagaga gacagaactt gaacgttctt cgatggttat actatacctt ctccactttt 60
 ttgtattcta ttttagttcc tatggtaaca aattttttta aagagggtac ctagttgagt 120
 ttaatagtag tataagatat atttttttct ttgcaatagc tataagtgtg ttaaactttt 180

ttatagcgga acggtttagt atctctagaa gaggaatggt atacttctta actttagaag 240
 gaatatcctt atacttggtta aatttcttag taaagaaata ttggaagcat gtgtttttta 300
 atccaaaaaa tagcaagaaa attttactgt taacagtaac ggaaaatata gaaaaagttc 360
 ttgataaaatt gctagaatct gatgaacttt catggaaact ggtagcagta agtgttttgg 420
 ataaatctga ttttcaacat gataaaatac ctgtaattga aaaggaaaaa attattgaat 480
 ttgcaacgca tgaagttgtg gatgaggtgt ttgtcgatct 520

<210> 536
 <211> 210
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 536
 aatattttat ccatgttatt atcctactaa tcgtaatcta aaaaatctta ttaaaaatac 60
 gattcttgct ttcaaaatth tgagaaagga acgccctgat attatcgtct catcaggggc 120
 agctgtagca gttcctttct tttatctagg gaaaatatth ggtgctaaga cagtctatat 180
 agaagtattt gatagaattg atgctccgac 210

<210> 537
 <211> 405
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 537
 tgagggatth attcaggatg atgtttttat tcaaacagga tactctaatt atgttccaaa 60
 attttgtaaa tgggaaaaat taatatctta tgaaaaaatg aatcaattga ttaaggaatc 120
 agatattatc attacccatg gcggtccagc tacgtttatg gcagttattg ctaaaggtaa 180
 aaatccaata attgttccgc ggctaaaaaa atttggtgag catgtaaatg atcaccagat 240
 gcaatttgta aaaataacga aagaaatata caatttaata gttatagatg atatttcaga 300
 cttacattta attcttcata attttaagga caaacattth gaaacttatt tgaataacga 360
 gagatttaat gtacgtttca atgtggaaat cagtaacctt tttaa 405

<210> 538
 <211> 622
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 538
 tgctttaact cttttaccaa cctatataaa agaaaaacaa gtttttaaaa tagatacacc 60

gtctttttgt atggtgctat ggactattat atattctata tctataatat ttaattctct 120
gattgatgga ttggctgttc aagtgttatt ttcagatttg agtaaagcat ttaattggct 180
aatagcagta tttttttata attattattt gaaaatgcc aatcaatattg acaggataaa 240
gagatatatg tattataaatt ttactatctt agttgttttt gtcggtttat tctatataca 300
aagaggctcc aatgtaattt tgtttggaag aagtttgta gactgggacg gatttacatt 360
agctactagt tatggtgtaa gatatacagg ttttttagaa tacgcaactt taaatggtca 420
gttaattctt tttttattac cgtaatttag attgtttaga tttagatttt ttacacaaac 480
tatcattttt gcttttcttc tagaggtttt ggtactaagc aaatctagaa tagcgattgt 540
tgcaatgctt atatatatag catttgcagt agtcaatgag attaattcaa acaataaatg 600
gcttattgga attttctgtc ca 622

<210> 539
<211> 687
<212> DNA
<213> Streptococcus pneumoniae

<400> 539
aaggcaattc caatacaaag cagatcgta ttattgataa tttttctaat aacggtacgg 60
gtgaaaaact acaagagctg tatgagtcag attcagagat tgatgtcttg attaaccatg 120
aaaatgctgg tttcgctcga ggtaataatg tagcatatca gtttgctaag gaaaagtaca 180
aacctgattt tatggttatc atgaataatg atattgagat agaaacagaa gagtttgaaa 240
aaatcgtgac agatatctat cggaaggaaa aattccattt gttaggacca gatattcttt 300
cgacgacgta tcagcttcac caaaacccaa aacggttgac gcattatact tatgaagagg 360
ttaaggctct caatgaaaaa tttaagaaag ggagccaagt tagtctagca ttaaaaatta 420
aatgttggtt gaagtctagt aaagttcttc ggacagcaat ctatcaaaat aggcgtaaaa 480
agaaatcagt agactataga aaacaggtag aaaacccaat tcttcatggt tcgtttattg 540
tatattctag agatttaatt gagaaagagg agtatgcttt taatcccaat accttcttct 600
attatgaaac agagatatta gattatgaag ctgagttaa aggatataag agaatttata 660
caccgaagat taaggctctg caccatc 687

<210> 540
<211> 534
<212> DNA

<213> Streptococcus pneumoniae

<400> 540

| | |
|--|-----|
| tttcaatgcc tctcttggct cttaatcgcc ctagtctaaa taccaagatt aaagtgcg | 60 |
| atcggctcat tgatatccaa ttctggaaaa tagctcttac tattatagtt gacctatta | 120 |
| ttctatatct ttataggaga gagattcata atcttgcaact tagccatggt tatacgggtt | 180 |
| caaattttca gtggttcttt agaaatgcta ccagttatga aggtgagcta acagtgcgaa | 240 |
| cttcgattog ggtcctcatt cgtatcattg acgtatctgc ttatatTTTT ggatatactt | 300 |
| ttattaataa tttcttcatt tatagtcata aacgctctaa agatttactg ctcttagttc | 360 |
| cattcttgat ttttatTTTt aaaaccttat tatctggggg tagattggat attataaaaa | 420 |
| ttttaattgc gtatgttgta atggcctata ttcagcaaaa acgaaaagtt ggctgggata | 480 |
| aggatcatct ccataaatat atgagacttg gttttgtagg cttgatagct ggga | 534 |

<210> 541

<211> 450

<212> DNA

<213> Streptococcus pneumoniae

<400> 541

| | |
|--|-----|
| tccattagtc aatgagttga aaaaacacga agatatggaa acaattgtgt gtgttactgg | 60 |
| acaacacaaa gagatgggta gtcctgtttt agatttatTTt ggtgttgtag cagattatga | 120 |
| tttagaaatt atgaaggcta accaaacctt gttctctatc acaactagta tcttggaaaa | 180 |
| gataaaacca gttttagaga aggaacaacc agatattgtc ctagtgcacg gtgacactac | 240 |
| gacaacttat gcagcagcct tggcagcatt ctatttggga attaaagtag gacatgttga | 300 |
| agctggtttg cgaacgtaca atttacaag tccatttctt gaagaattta acaggcaatc | 360 |
| gacatcaatc attgcaactt accattttgc tccaactgag ttggctaaag aaaatctctt | 420 |
| aaaagaaggt agagagaatg tttatgtgac | 450 |

<210> 542

<211> 565

<212> DNA

<213> Streptococcus pneumoniae

<400> 542

| | |
|---|-----|
| gaagcatagc acaaacttcc aagtgttttc aaagatagaa ttatcgctgg gaaatatcag | 60 |
| gttcttactt atcaatactg tgatacgttg cattgctact ttctctgact attcctttta | 120 |
| gcagatgaaa gaaaacgttt gggcttgcca cgaaatacca atctaggatt gcatttgatt | 180 |

gatatcattc ctttagatgg agcaccaaat cattcggttt taagaaagat ttacttttgt 240
 aaagtatact ggtatcggtt ttttagcaagc ttaggaacaa cttatgttgg cgaccatgtg 300
 gatatgcatt ccactaagca aaaactaatt attgggttct ttaaaaaact aggatttgca 360
 aaactatttc ctcaaaattc tgtatacaga cgcttggata atctctatag aaagtatgat 420
 tggaaaaagc agaagtatgc ggggactatc aatgcttctt tatttgctaa agaagttatg 480
 ccagtagaga tttggggaga aggagtagag aagccttttg aggatacctt ctttaaagtt 540
 ccaacggagt atgatcgcta cctga 565

<210> 543
 <211> 662
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 543
 gtgatagtga acttgggatt gtctagtatt attcagtaca tttcttattt tatgttgatg 60
 ttgtgtgtat ttttaacatt aattaagaat actctcaacg tgtttgcaaa tagaatcata 120
 tattttttga ttatttcatt tttgtttatt attgggatta atttacaaaa tcttccatta 180
 tcaagaaaga tttattttatc attctctatg ttaattattt ctagcttata caccttaccg 240
 ataaagctaa taaataatct cagtgattta agaaggatat catattactt attgcacagc 300
 atatttttat ctgtattttt aggtttgggt tttaaaatat ctttagtaac agttgctgta 360
 gagggaattg gcttttcata tgggtttaat ggaggtttga ctcataaaaa tttttatgca 420
 attacaattt tagtttcccta tattctacta tatgtcagca gaaaatatga cgctaaacat 480
 cagattgata gttttgtatt atgggttagat ctttttttac ttttaatatc taatacgcga 540
 acagtttata taatactagt tgtttttttg attattatta atagaaattt tataaataat 600
 attaaaaaag agcatagact ggtagtgaac gcaacgacaa tagtcatctc ttactggcg 660
 tt 662

<210> 544
 <211> 380
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 544
 agagcaaaaa cgctgggttc tcaacaggtc aaccttggtt ggcggttaat ccaaattacg 60
 agatgatcaa cgtacaagaa gcgctggcaa atccagattc tattttctat acctatcaga 120

| | |
|--|-----|
| aactggtcca aattcgcaag gagaatagct ggctaattcg agctgacttt gaattgcttg | 180 |
| atacggctga taaggctctt gcttatatac gtaaggatgg cgaccgtcgc ttcctagtgtg | 240 |
| tggctaactt gtccaatgaa gagcaagact tgacagtaga aggaaaagtc aaatctgtct | 300 |
| tgattgaaaa caccctagct caagaagtct ttgaaaaaca aatcttagtt ccatgggatg | 360 |
| ctttctgtgt ggaattacta | 380 |

<210> 545
 <211> 610
 <212> DNA
 <213> Streptococcus pneumoniae

| | |
|---|-----|
| <400> 545 | |
| acgaacagtg gacctgatac atgggccgat tcttcctcgt ctcttaagct tcacctttcc | 60 |
| aatcttgcta tcaaatatct ttcaacagct ctataacact gctgatgtct tgattgttgg | 120 |
| acgatttctt ggtcaagaat ccttggtcgc agtaggagcg acgacagcga tttttgacct | 180 |
| gattgtaggc tttacacttg gtgttgcaa tggcatgggg attgtcattg ctcggtatta | 240 |
| tggggctcgg aatttacta aaatcaagga agcagtagca gccacctgga ttttaggtgc | 300 |
| tcttttgagc attctagtta tgttgctggg ctttcttggc ttgtatcctc tcttgcaata | 360 |
| cttagatact cctgcagaaa ttcttcctca atcttatcaa tatatttcta tgattgtgac | 420 |
| ctgtgtaggt gtcagctttg cttataatct ttttgaggc ttgttgcggc ctattggtga | 480 |
| cagtctagca gccctgggat ttctgatttt ctctgccttg gttaatgtgg ttctggatct | 540 |
| ctattttatt acgcaattgc atctgggagt tcaatccgca ggacttgcta ccattatttc | 600 |
| gcaagggtta | 610 |

<210> 546
 <211> 546
 <212> DNA
 <213> Streptococcus pneumoniae

| | |
|---|-----|
| <400> 546 | |
| ttgtcttgac tggttgtgtc aatgtcgata aaaccacagg tcagccaaca ggatttattt | 60 |
| ggaataccat cggagcccct atggctgaag ctatcaagta cttcgtact gataaaggtc | 120 |
| taggctttgg tgctgctatc atcatcgtaa ccattatcgt gcgcttgatt atcttgccac | 180 |
| ttggtatcta ccaatcatgg aaggcaacgc ttactctga aaagatgaac gccctcaagc | 240 |
| acgtccttga gccacaccaa acgcgtctca aagaagcgac tactcaagaa gaaaaactcg | 300 |

aagcccaaca agctctcttt gctgctcaaa aagagcacgg tatcagcatg tttggcggtg 360
 taggatgttt ccctatcctc cttcaaagtc ctttcttctc tgctatctac tttgctgccc 420
 aacatactga aggggttgct caagcaagct acctaggcat tcctctaggt tctccaagta 480
 tgattttggt tgctgtgct ggtgtccttt actatcttca atcgctcctt tcacttcacg 540
 gagtag 546

<210> 547
 <211> 262
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 547
 tgcaaaaggt tagaatgatt gcccaaggta gggtagagg agtcggcttt cgttggggtg 60
 tttacagctt ggcacttgaa attggtggca tcacaggctg agtatggaat aacgacgatg 120
 gcacagtgga aatcttagcc caagcagact catctgctat catggcaaaa tttatccaag 180
 aaatccgaaa aggaccgaca cttttttcaa aagtaagcta cttagatgtc aaactaagca 240
 actttcctcc ctactctgac tt 262

<210> 548
 <211> 629
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 548
 gttcggtaat ccagttgaag tcccttttga acattgggaa ctagaacatt gaattccaat 60
 tctccatccg aagacttggc ttcaatctgt gaagctgagg gaactaaatc ctcgtttgaa 120
 gcgtagtaaa gggttacacg gtaacggaca cgcttgtttt ggtccaaggc tttacgcacc 180
 ttgctttcat agtagttttg accagtcgaa tactcggctt gtgcctgatt tgcccaggct 240
 gtctgaacag caatgttttt aggattgctt gttgaggcat caaaaccatc caaaccaccg 300
 attaaggcat agcctaacaa atgacctcta tcgactgcat gggataaga gccctttaga 360
 ttcttgacct gatgccaaac tggaggagtc caagaagttg aaccattccc agttttctta 420
 cgattcttgt actgacgagt ggccttagac aagaggcat tagctacggg tggaacagtt 480
 tccttgccca ctgtctttgt tttattgtca gcgtagggt tacttgaaac cttggcatct 540
 agatttggtt tattaccatt gacgataaaa gcacctgagc cattccactc cagactcccc 600
 tttatttgac tcttgactgc gtctgttaa 629

<210> 549
<211> 323
<212> DNA
<213> Streptococcus pneumoniae

<400> 549
cgtggaaatt ttagaagaac tcttcccagg ctacgaaaac acgtggcgtt cttcccaaga 60
gcctgcccgt aaaggctatg ctggaacat gttcctttat aagaaagaac ttacacctac 120
tatcagcttc ccagaaatcg gtgccccttc taccatggac ttggaaggtc gtatcatcac 180
tctagaatit gatgcattit tctgaacca agtttacct ccaaacgctg gtgacggtct 240
caaacgcttg gaagaacgcc aagtctggga tgccaaatat gctgagtatt tggctgaact 300
agacaaagaa aaaccagtcc ttg 323

<210> 550
<211> 206
<212> DNA
<213> Streptococcus pneumoniae

<400> 550
aaaatttggg ggattcagtt agctgcaatt aaaaaattg gtgttttgag ggaagaacgt 60
ataagcccca atcagctttg gcatgcactg gaaacagatt atgccggaga agaaggtaag 120
gtcattcaag aaatgttgat tcatgatgca cctaagtatg gtaatgatga tgattatgct 180
gacaaattgg ttactgctgc ttatga 206

<210> 551
<211> 510
<212> DNA
<213> Streptococcus pneumoniae

<400> 551
cctctaaggc tatgatggaa aagattgctg ttgctaagtc aaggacggta gaagaagatc 60
agacaaaagt ctgtgtaact cgctacggca atgttctatg tagtcgtggg tctgtgattc 120
ccctatggat tgatcaaata aagcaaggga atcctataac gattacggaa cctagtatga 180
ctcgttttat tatgtcctta gaagaagcgg tagacctagt tctgtttgct ttgaaaaag 240
gaaaaacagg agatatccta gtacagaaag caccagcatg taccattgaa gtgttggcgc 300
aagctgttac ggaacttttt gcacctaatc aagatattaa agtaatcggg attcggcacg 360
gtgaaaagat gtatgaaacg ttgttgacta ctgaagaatg tacgaatgcc attgatttag 420

gcgcgttttta tcgtgtgcct agcgataatc gagatcttaa ctatgataag tatttcaacg 480
aaggggatgc caaacgcaat cccttaatag 510

<210> 552
<211> 589
<212> DNA
<213> Streptococcus pneumoniae

<400> 552
tgaaagatgg acgagatagg actcgtccta atttagagat tggagagatt tttcagtatg 60
atcgtgatac agatccgatt ttattagatg aatattgtaa gaaggccgat ttcgtattcc 120
atttagctgg tgtcaatcgt ccacagaatc ctgatgaatt catggaggga aattacggtt 180
tttcaagtag attattggag attttagaaa agtatgaaaa cacttgtcct gttctactct 240
caagttctac tcaagctagt ttagaaggcc gattttcaaa ctctatatat ggacaatcta 300
agctagtagg ggaagaactc ttctttgaat atggaagaa aacgggagca cctgtccttag 360
tttaccgttt cccgaatctt tatgggaagt ggtgccgtcc taactacaat tctgctgtag 420
caactttctg tcataatcta gctcacgatt tacctattca agtaaatgat ccaagtgtag 480
aattggagtt gctgtatatt gatgatattga tacaagagtg tctaactgca ttggaaggaa 540
atcctcatcg ttgtaatcta gatggattac aaatcttacc tagcccatc 589

<210> 553
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 553
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tacaaaattga tgaatcaaata taaaccagat gctttattga ttttagggga tacaaaattct 120
tgtttatcag ctattactgc caagcgttta catattccaa tttttcatat ggaggctggc 180
aatcgtctga aggatgagtg cctgccggaa gagactaatc gtcggattgt tgatattatt 240
tcagatgtta acttagcata ctctgaacat gcacgtaagt atttacctga gtgtgggtta 300
cctaaagagc gcacatatgt aacaggttct cctatggcag aagtgttaca taaaaattta 360
tctgccattg agtcttcaga tatccatgaa cgtttgggat tgaaaaaagg aggttatatc 420
ttactttcag ctacacgtga ggaaaaatatt gatacagata aaaattttat ttctctcttt 480
acagcaatta atcaatttagc tgaaaagtat aatatgcaa tcttatattc ttgccatcct 540

agatc 545

<210> 554
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 554
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agctaggtga ttatttgatt gtagttgttt caagtgatga gtttaattta aaagaaaaga 120
ataaagtatg ttactttaac tacgaacaca gaaaaaattt agtagaagct attcgatatg 180
tcgatttagt aatccctgaa actagttggg aacagaaaaa gtcagatggt aaagactacc 240
atattgacac 250

<210> 555
<211> 283
<212> DNA
<213> Streptococcus pneumoniae

<400> 555
ctcctagtgc cctatatctt tgaatttcct gcggatgatg ccctgcgtct caaggaaaga 60
atgcctctct tagaggaagt gggcgtcttt ctagcagagt acggagaaaa tcaatttatt 120
ctacgtgaac atcctatttg gatggcagaa gaagagattg aatcaggcat ctatgagatg 180
tgcgacatgc tccttttgac caaggaagtt tctatcaaga aataccgagc agagctggct 240
atcatgatgt cttgcaagcg atctatcaag gccaatcatc gta 283

<210> 556
<211> 284
<212> DNA
<213> Streptococcus pneumoniae

<400> 556
cttgggtgcac agagtcctca aaaatcaatt tcagaacaaa cagcttatga aattgatgaa 60
gaggttcggt cattattaaa tgaggcacga aataaagctg ctgaaattat tcagtcaaatt 120
cgtgaaactc acaagttaat tgcagaagca ttattgaaat acgaaacatt ggatagtaca 180
caaattaaag ctctttacga aacaggaaaag atgcctgaag cagtagaaga ggaatctcat 240
gcactatcct atgatgaagt aaagtcaaaa atgaatgacg aaaa 284

<210> 557
<211> 627

<212> DNA

<213> Streptococcus pneumoniae

<400> 557

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aagtaggcga tggttatgtc ttgaggaga atggagtttc tcgttatatc ccagccaagg      60
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ctcataagct aggaactaag aaaactgacc tcccatctag tgatcgagaa ttttacaata      180
aggcttatga cttactagca agaattcacc aagatttact tgataataaa ggtcgacaag      240
ttgattttga ggctttggat aacctgttg aacgactcaa ggatgtctca agtgataaag      300
tcaagttagt ggaagatatt cttgccttct tagctccgat tcgtcatcca gaacgttttag      360
gaaaaccaa tgcgcaaatt acctacactg atgatgagat tcaagtagcc aagttggcag      420
gcaagtacac agcagaagac ggttatatct ttgatcctcg tgatataacc agtgatgagg      480
gggatgccta tgtaactcca catatgaccc atagccactg gattaaaaaa gatagtttgt      540
ctgaagctga gagagcggca gccaggtt atgctaaaga gaaaggtttg acccctcctt      600
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<210> 558

<211> 784

<212> DNA

<213> Streptococcus pneumoniae

<400> 558

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gcatctctcg ttatgtcttt gcgaaagatt taccatctga aactgttaaa aatcttgaaa      60
gcaagttatc aaaacaagag agtgtttcac acactttaac tgctaaaaaa gaaaatgttg      120
ctcctcgtga ccaagaatth tatgataaag catataatct gttaactgag gctcataaag      180
ccttgtttga aaataagggt cgtaattctg atttccaagc cttagacaaa ttattagaac      240
gcttgaatga tgaatcgact aataaagaaa aattggtaga tgatttattg gcattcctag      300
caccaattac ccatccagag cgacttggca aaccaaattc tcaaattgag tatactgaag      360
acgaagtctg tattgtctca ttagctgata agtatacaac gtcagatggt tacatttttg      420
atgaacatga tataatcagt gatgaaggag atgcatatgt aacgcctcat atgggccata      480
gtcactggat tggaaaagat agcctttctg ataaggaaaa agttgcagct caagcctata      540
ctaaagaaaa aggtatccta cctccatctc cagacgcaga tgttaaagca aatccaactg      600
gagatagtgc agcagctatt tacaatcgtg tgaaagggga aaaacgaatt ccactcgttc      660
gacttccata tatggttgag catacagttg aggttaaaaa cggtaatthg attattcctc      720

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ataaggatca ttaccataat attaaatttg cttggtttga tgatcacaca tacaaagctc 780
caaa 784

<210> 559
<211> 502
<212> DNA
<213> Streptococcus pneumoniae

<400> 559
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atggtgccta tcagtggaac tggttctaca gtttctacaa atgcaaaacc taatgaagta 120
gtgtctagtc taggcagtct ttcaagcaat ctttcttctt taacgacaag taaggagctc 180
tcttcagcat ctgatgggta tatttttaat ccaaaagata tcgttgaaga aacggctaca 240
gcttatattg taagacatgg tgatcatttc cattacattc caaaatcaaa tcaaattggg 300
caaccgactc ttccaaacaa tagtctagca acaccttctc catctcttcc aatcaatcca 360
ggaacttcac atgagaaaca tgaagaagat ggatacggat ttgatgctaa tcgtattatc 420
gctgaagatg aatcagggtt tgatcatgag caccgagacc acaatcatta tttcttcaag 480
aaggacttga cagaagagca aa 502

<210> 560
<211> 462
<212> DNA
<213> Streptococcus pneumoniae

<400> 560
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acttcaaaag ctctctaacg cctgatgaac tgatatagag atgttcaggc cgactatgta 120
aataaatagt ctctatatca gaagacagct gatgattgta gtaatcaaaa ctggcttcat 180
attgcaaate cgacgcattc ctcaaaccac gcactagaca agtagcacc aatctttttg 240
caacatcgac caccaattca tcatgagaag ccacgacttc aacattttcc agatgtccca 300
aagccttttc tagcccccggt ttacgatttt cgataggaag aaatccttgt ttgtggggat 360
taaaaaaat acccacataa agcttatcaa aaagtctgct cgcccggtca atgatatcca 420
gatgccatt tgatcatcga tcaaatgagc ctgtgaataa gc 462

<210> 561
<211> 508

<212> DNA

<213> Streptococcus pneumoniae

<400> 561

| | |
|--|-----|
| gatttctgta tgaggcagtt cgcgattgac tgcaaattta tcattgtttt cacagagtga | 60 |
| accaaccaca tctaccgctt cagctggtcc atctggatgg gtcacgttgc taatatgatg | 120 |
| gtaagctccg tacatagctg gacgcatgag gttgactgct gaggcacca cacctagata | 180 |
| ggtacggtag gtttccttct tatgagtga ctttgtgact agagcaccgt gaggtgccag | 240 |
| cataaaacga cccaattcgg tgaaaatctt gacctgacca agacctgctg acgtaagaac | 300 |
| ttcttcatac accttacgaa ctccctcacc aatcaaggcg atatcgttcg gtccttggtc | 360 |
| tggacgataa ttaacaccaa taccgccaga aagattgata aagtctagcc aaatgcccaa | 420 |
| cttttccttg atttcaacag ccagttcaaa gagctgacga gccaaactctg gataatagag | 480 |
| atgggtcacg gtattggacg ctaggaag | 508 |

<210> 562

<211> 652

<212> DNA

<213> Streptococcus pneumoniae

<400> 562

| | |
|---|-----|
| ggctgttagt ccaagtcaag aactatattg aaagatcaaa gtaaaggaag ttcgttattt | 60 |
| gaaggaattt agaaatttaa attctaagga tgcaaggga tatgacttgg ctttattaat | 120 |
| tctagaaaag cccattggtg caaaattagg gactttgggt cttcctacta gtcaaaaaaa | 180 |
| tttgacagga ataactgtga ctatcacagg ctatccatca tataatttta aaattcatca | 240 |
| aatgtatata gataaaaaac aagttttaag tgatgatggc atgttcttgg attaccaagt | 300 |
| tgatacttta gaggggtcta gtggatctac agtttatagt gctagtcacc gtgtagtagg | 360 |
| agtgcatact ttaggagatg gagctaata aattaacagt gcagttaa taaatgaagc | 420 |
| aaattgccat ttacttattt attcggttct taaaggttac tctcttgaag gatggaagaa | 480 |
| aataaatggg agttggtact attatagaca acatgataa caaacgggtt ggcaggagat | 540 |
| aatgatact tgggtattat tagacagttc cggtaagatg cttacagatt ggcaaaaagt | 600 |
| aatggaaac tgggtattat tcaattcaaa tggagcaatg gttacagga gc | 652 |

<210> 563

<211> 250

<212> DNA

<213> Streptococcus pneumoniae

<400> 563
cttgtgctgt tcttcgttga tttccttgat atccaaaaga accaagtcag tgacagccat 60
gagtttgtca aactttctcaa ggtaacgcgg tttattacgg aaaggaagag cacaggtgtc 120
caaggtacag tggattcctt gttccttagc cttggtgaag agagcaatca ggaaatcaat 180
ctgcaagaga gcttctcctc cactgactgt aatcccaccc ttatttcccc agaaaccacg 240
gtagcgcaag 250

<210> 564
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 564
ttgatatcca acaactacaa aaagacgaag taaacaatat tacatatattt gctgaaaatg 60
ctgctggcga agactgggat ttatcagata atgtcggttg gggccagac ttgcccgatc 120
catcaaccta cttgatatac atcaaaccat ctgtaggaga aagtactaaa acatatattag 180
ggtttgactc aggggaagat aatgtagctg ctaaaaaagt aggtctatat gactacgaaa 240
aattggttac tgaggctggt gatgaggcta cagatgttgc taaacgctat gataaatcag 300
ctgcagccca agcttggttg acagatagtg ctttgattat tccaactaca tctcgtacag 360
ggcgtccaat cttgtctaag atggtaccat ttacaatacc atttgcattg tcaggaaata 420
aaggtacaag tgaaccaatc ttatataaat acttggaact tcaagacaag gcagtcactg 480
tagatgaata ccaaaaagct 500

<210> 565
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 565
aggaaaacaga aaataaagag aaacataaag atattcataa tgctatagaa acttcaaagg 60
atactgaaga aaagaaaaca acaattattg aggaaaaaga agttgttagt aaaaatcctg 120
taatagacac taaaactagc aatgaagaag caaaaaacaa agaagaaaat tccaatcaat 180
ccaagggaga tcatacggac tcatttgtga ataaaaacac agaaaatccc aaaaaagaag 240
ataaagttgt ctatatgtct gaatttaaag ataaagaatc tggagaaaaa gcaatcaagg 300
gactatcaaaa tcttaagaat acaaaaagttt tatatactta tgatagaatt tttaacggta 360

gtgccataga aacaactccg gataacttgg acaaaattaa acaaatagaa ggtatttcat 420
 cgattgaaag ggcacaaaaa gtccaacca tgatgaatca tgccagaaag gaaattggag 480
 ttgaggaagc tattgattac ctaaagtcta tcaatgctcc gtttg 525

<210> 566
 <211> 250
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 566
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 aagccgagga tcaaaaagaa gaagatcgtc gtaactaccc aaccaatact tacaaaacgc 120
 ttgaacttga aattgctgag ttcgatgtga aagttaaaga agcggagctt gaactagtaa 180
 aagaggaagc taaagaatct cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg 240
 agagtaaaaa 250

<210> 567
 <211> 280
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 567
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 tcgtgaacaa gctgaggcta caagggttaga aaacatcaag acagatcggtg aaaaagcaga 120
 agaagctaaa cgaaaagcag aagcagaaga agttaagat aaactaaaga ggcggacaaa 180
 acgagcagtt cctggagagc cagcaacacc tgataaaaaa gaaaatgatg cgaagtcttc 240
 agattctagc gtaggtgaag aaactcttcc aagcccatcc 280

<210> 568
 <211> 414
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 568
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 aagagtgact tgtagtcaaa ctgcttttca cgttcttctt gggcattgtc cgcaaagacc 120
 gctacacctg ccagttctga gtcgaactcg cgcaagagac taatcatacc gttgaccggt 180
 ccgccacctt tcaagaagtc atccacaatc aagacacggc tgctgcctt aagactacgt 240
 tttgaaagga acattttctc gatacgggtc ccacttgaac ctgaaacata gttgacgcta 300

acagttgaac cttcggtaat ttccaggtca cggcgacaaa tgacaaaaga gacattgagg 360
acattggcaa ctgcatttgc aagtggcaca cccttagttg ctacggtcac aacc 414

<210> 569
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

<400> 569
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actaagacag cgaccttga cttccgtcag gggaatcctg agccacgcta ccaagatgtt 120
ccacttggtt ccatcaactc tatgggcttg ccaataatg gcttagacta ttatttggat 180
tatcttttgg atttgcagga aaaagagtcg aaccgaactt tcttcttacc tctggtcggc 240
atgtctccag aggaaaccca tactatttgg aaaaaagtcc aagagagtga ttttcgtggt 300
ctgactgagc ta 312

<210> 570
<211> 599
<212> DNA
<213> Streptococcus pneumoniae

<400> 570
ttgtagggt aggaacaggt tctactgcct attattttgt cgaagaaatc ggtcgtcgaa 60
tcaaggaaga aggcttgcag attacagctg tgacgacttc tagtgtgacc agtaaacagg 120
ctgaagggtt caatatcccg ctcaagtcta ttgaccaagt agactttgtc gatgtgacag 180
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cagagcaggt ctttcgtcat ttgaaacgag ctggctacaa accaagtttc cgtgaaaaag 420
acggccaacg ttttgtgacc gatatgcaga attttatcat tgacctcgcc ttggatgtca 480
ttgaaaatcc aattgctttt ggacaagaat tggaccatgt cgttggtggt gtggagcatg 540
gtttattcaa ccaaatggtg gataaggtaa tcgttgctgg acgagatgga gttcagatt 599

<210> 571
<211> 450
<212> DNA
<213> Streptococcus pneumoniae

<400> 571
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 atggcggagc ttcgtaaga attgacaaac ttgggactgg aaaaggttga gagctacatc 120
 aatagtggca atattttctt tacttcgata gattccaaag cccaattggg tgaaaagcta 180
 gagactttct ttgcagtcca ttatccatth attcagagct tttctttact gagtctagag 240
 gactttgagg cggaacttga aaatctacca gcttggttga gcagagactt ggcacgaaaa 300
 gattttctct tttaactga gggtttgat gtggaccaag tcacgcgcac agttgaaagt 360
 ttagagctga aagatgaagt gctttattht ggaaaacttg ggattttctg ggggaaatth 420
 tctgaagaat cctattctaa gactgcctat 450

<210> 572
 <211> 527
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 572
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 gtttggaatg ctaagaatgg tttctgggat gttggtttgg aaagtcgtaa attagctgtt 120
 agtggaaaaa ttaagcatta tgtggttgat aatgacaatg ttgtgactcc cttgattcat 180
 aataatcgtg atattgttac atttacaggt aattcacgct ttaaacaccg ttctcgtggc 240
 tattttgaaa gtccaatgaa tgatattcct aactttaata ttggtaaaca agctaccttg 300
 gataaacatg gttatcgtga tccgaaattg gataaagtgc gattctthta gaaacaggct 360
 ctgcctcgat cttctagtca accaagcgct gaaccaatgg aaaatattgc ctcaggaaaa 420
 caggttactc aaagttcgac agctttcgga ggagatgcta gaagagctgt ggatggcaaa 480
 gtcgatggta actatggta caattctgtc actcatacaa acttcca 527

<210> 573
 <211> 561
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 573
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 tttatgtgaa tattcttggc aaagtttttg gtaattttct ttttgagttt tgctacgcc 120
 atcccaaaga atccatctga taaactccca ctcaaagcgt tcagggaat ctaccgccat 180

actttctctg acttttccac ggtatttaag ataacgctta aaggctctaa agagacaggt 240
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 ctcggttaac atccattcgc agtcactgtc ttgccaacca ggttgaaatt ggagtgtgtc 420
 catgtgcagt tttggaatgg agtagtagtt agataacttt tctgctatag ttgacttacc 480
 agaaccagaa tatccgataa ttgcgatttt cattttctac cttttcctat ttggagacaa 540
 aaaaacagcc tctatggact g 561

<210> 574
 <211> 503
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 574
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 caatcgcat ctgagtaaaa cgataatagt agctatcagg gtcgttttgg gctagactca 120
 gcattttcaa gaaacgggtcc agataccaac tttcaatata atccactcca gcatctacat 180
 agatggaaaa gtcaaagaag tcagtgatata agagacgata gttttgtgga ttttgaaaga 240
 cattgattcc ctcaacaatt acaaaatcag cagctttgac actttgtttc tcttcgggta 300
 cgatgtcgta aacttcatga gaatagacag gaatatctac atcttgtcca tttttgatgc 360
 ggtccaagaa gttgagaaga gcttccatat catagctttc aggaaatcct ttacgattta 420
 aaatcccctg ctcaatcaag gtttgattgg gatagagaaa accatcagtt gtaaccaact 480
 caaccgtagc atctgtaaac gta 503

<210> 575
 <211> 501
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 575
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 tcataagggt atagcggtag atgttattcc tgaaaaagta gagcttatca atcgtcgcca 120
 atctccatt aaggatgatg atattgaaac ttatttagtg gaaaaggaat tagacttagt 180
 tgcaacatta gatggtaatg aagcttatcg agatgtgac tttgtcataa ttgtgtccc 240
 aactaactat gacagtaaaa aaaattatct tgatacatct gttgtggaag cagttattga 300

gcagattatt gcggttaatt tgaaggcaac aattgtcata aaatccacaa ttcctgtggg 360
atatacagaa agtctccgaa cacgttttgg gcaatttaag attctcttta gtcctgaatt 420
tttacgggag tctaaagcac tttatgataa tctctatcct agtcgaatca tcgttgagac 480
agatttgaga gatacggagc a 501

<210> 576
<211> 200
<212> DNA
<213> Streptococcus pneumoniae

<400> 576
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ttattgatga atggactgtt taaatcagta gcacgccaac cagatatgct ttctgagttt 120
cgtagtttga tgtttttagg tgttaccttt attgaaggaa ctttctttgt aactcttgtc 180
ttctcattta ttatcaaata 200

<210> 577
<211> 300
<212> DNA
<213> Streptococcus pneumoniae

<400> 577
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tatctggaaa cctcaaaaaa gaagctttta gtagatgcag gcttgtcttg caagaaaatt 120
accagtctgc tagctgaaat taaccgtaag ccagaagacc tggatgccat cttgattacc 180
catgagcatt cagatcatat ccatggagta ggcgttttgg ctgcgaagta tggatggat 240
ctttatgcca atgaaaagac ctggcaagct atggaaaata gtaaatatct tggcaagggtg 300

<210> 578
<211> 550
<212> DNA
<213> Streptococcus pneumoniae

<400> 578
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ttaaaggagg atatttgatt gaacttgtcc agacattgaa atatatccta ttctttgcac 120
tagcgattag tatttctaatt ttttcttag aggatcgatt tagtatttcc agacgaggca 180
tgatttactt cctcacatta catgctctct tagtctatgt gctaaacctt tttatcaagt 240
ggatattgaa gcgggcttat cccaacttta aaggaagtaa gaagattctc ctacttacag 300

caacttctcg tgtcgaaaag gtactggata gattaataga atcaaatgag gttgttgggg 360
agttggtagc cgtcagtgtc ttagataaac cagattttca gcatgattgt ttaaaggtag 420
tagcagaggg ggagatagta aactttgcga ctcatgaggt ggtcgatgaa gtctttatca 480
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ttgatgtaac 550

<210> 579
<211> 345
<212> DNA
<213> Streptococcus pneumoniae

<400> 579
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ttgttggtaa tatgagtatt gtaggtccta gaccagcggg tataaatgaa ctagatttga 120
ttgcagagag agataagtat ggagcaaatg atatcttgcc agggttaact ggatgggcac 180
aaattaacgg gcgtgatact ttgtctgttg agatgaagac ggagttagat ggctactatg 240
ttaaacaatc gtctttgata atggatatta gatgtatagt taagacaata ccttacgtac 300
tgaaacgaaa aggtattgta gagggtagtg gtaagaaaga aagtt 345

<210> 580
<211> 600
<212> DNA
<213> Streptococcus pneumoniae

<400> 580
taacgagatt attacaaaac aaaactacta tcgtatttct tttcttggtg aaggaaaatt 60
aagtaagata ttaggttatg taaaattcag aaaagaaatt aaaaagaagc taaaagaaaa 120
tgattatgat atgatattgc cgttacatag tattgtgtct ttcatttttag tagattttct 180
tctcttttca tttaaaaata gatatattta tgatattcgt gattacagtt atgaaaaatt 240
tttggtttat cgtttggttc agaaacaatt ggtgaaaaat tctttaatga atatcgtttc 300
ttcagacggc tataaat ttttaccat gggagagtat tttactaccc ataacctacc 360
caatatgata gaattaaacg aggtaaagca gttaaaaaat aatagtacgt ttccaattca 420
actttcctac attggtttaa ttcgttttca agaacaaaat aaaaaataa tcgatttttt 480
tgcaaatgac agtcgatttc agttgaattt tataggtagt aatgcaggag aattaaggga 540
attttgtcaa gaaaaaaata tcagcaatgt taacttggtg gacacattcc agcctaaaga 600

<210> 581
 <211> 561
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 581
 gaaagaattg ggtgcaaagg tttatcatgt gcctctatta aggaaaaagc ctctacatca 60
 gtttctctct cttgctagaa taataaagaa aggagattat gatatagtgc attgccatgg 120
 ctataaatct gcaattgggc tgatcttato taaaataaatt ggttgtaaaa ttagaattat 180
 tcatagtcat atggcttatg taacagaaaa cagttttcaa aaagtattgc gtaaattagt 240
 aacaattttg gtaaaaatct tagcaactca ttggtttgca tgtggggaag attcggctaa 300
 gtggttatat ggagagaaag cgtataaaga cggaaaaatt gaaattattt ttaatgcaat 360
 tgatttgaaa agtatcaat ttttgtcaga tgttagagaa aaatgctgta gagaattaga 420
 tgtgtcaaat aagtctgat taggaaatat agctcgccta tcagatcaaa aaaaccaag 480
 ttatttattt aacgttttaa aagaactcat tttaatcaaa ccaaatgtta tttactcct 540
 agttggtaat ggtgaggatg a 561

<210> 582
 <211> 736
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 582
 gcttccatca aatcacttta cactactaat tcagatttgg atttaaattt atggattatt 60
 gctgataaag tttcggatag aaataaagaa aagataaata gattatcaaa acaatttgcg 120
 cagagagaaa ttaattggat agagaacggt gagatcccat ttaaattaca tttagatagg 180
 ggatcaatta gttcathtag cagattattt ctgggaagtg ttcttccatc ttcaatgagt 240
 aaagttcttt atcttgacag tgatattatt gttatggatt ctttacgaag tatttttgat 300
 attgatttta agggtaaaat tctctatggg gtgaatgata cttttaataa agaatacaag 360
 caggtgttgg gtataccaat tgacaagcca atgtttaatg ctggagttaa gcttattaat 420
 ttagagttaa ggagaaataa taacgtcgaa gaaagatttt tgcaagtaat tcaaaagttt 480
 aatggtacta tattacaagg agatttaggg gttttaaatg cagttttata taactcattt 540
 ggtgtacttc ctccagaata taattatatg accatatattg aagatttgac ttatgaagaa 600
 atgatagttt ttaaaaaacc aattaattat tattcaaaag aggaaattaa aaatgccaga 660

gaacgtatag tcttacgaca ttccacaact agttttttat caaaaagacc ttggcaagaa 720
ggcagtaatg ttgcac 736

<210> 583
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 583
tggaagacct ttatcctgtc ttttaacagt tcctttcgtg aaaacaaata ttactcccaa 60
tcaaatatct tatttatcta taattccttt gattgttgga tttataataa tgatatttac 120
aactgatttc gttgtattat tactggcatg gtttctatct tttttatgga acttactaga 180
tgtagtagat gggaacttag ccagatatcg ggagcaatac tcgaaggatg gaagtgtagt 240
agatgcaatg gctggctatg tagccatggt gttgacgtat ttcggtgcag gaatagtagc 300
tgctcattta aacgactcag atatctatat aattttgggt gcattatctg ggatttcatt 360
gatttttcca aggttagtga tgcataagta tatcaataca gtagctcaag atgagtctgt 420
gagtagcatt aaagataaat ctgattttta tactataaaa atactggctc taaacatgac 480
atcaattaca ggaattccgc aggttttact gctattaact atttt 525

<210> 584
<211> 596
<212> DNA
<213> Streptococcus pneumoniae

<400> 584
ctataatggt gagcgatatt tgccacaaca gattgatagt attaggctc aaacattcac 60
taattggacg ctttttatta gggatgatgg atcaaaagat aaaacaatag aagtaataca 120
gaggtattct aagatagatg atagaattag attcgttgaa aatccctcaa agtttcatgg 180
agcttattac aattttttta atctaattga atacgttaaa aacaattatc aatttgatta 240
ttactttttt tgtgatcaag atgatatttg gaaagagcac aagttagaaa tacagctgtt 300
aagattttct aaagatgaca tgccagagat ggtttactct gatatgtcaa cgattgatgc 360
cagtaataat ttgatagata ttagtataaa taaaataatg gggattgaat taccgaacat 420
aaataatttg tattttattc atgcctatat ctgggggtgt actgcagggt ttaatcatgc 480
attgctagag atggttcctt cagttgatat tgataaagat tatttatata tagaaaaact 540
gtctcatgat aattattttg caaagtttgc actagagtat gggaagggtg tgttct 596

<210> 585
<211> 530
<212> DNA
<213> Streptococcus pneumoniae

<400> 585
cgtatcaagt cggcatthttc aaactttggg tatgcaaat aatttttggc tggcagagaa 60
tgtggaattt ctggaatttg gattacctcg aaatgatgat ttttttaaaa gtgaaaaaat 120
caaaaccaca aatataaaat ttagaacatt atttgatatc gatttagacg aactggtagt 180
tttgtatatg ccgacgttca gagatgatgg atcgttgaat gcctataatt tagattactc 240
gaaactaata catgtttttc aaaataaatt tagaaaaaat gtaaaaatat tagttcgttt 300
tcatccaaat gttgattcta gttttataaa ttacaggat acagactgta taaatgtgtc 360
gacctattca aatcctcagg atctgatgat gagtgcagat gtgatgatta cggattattc 420
atcggcttct attgatttta tgttattaaa tcgtccagta tttctgtatt taccagatta 480
tcaaagttat gtgaatgata gaccattgga tgataacttt gataaattgc 530

<210> 586
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 586
ggatatgcc acaaaaaacgt tagccagcaa agttcaagtg gctgtaccag ctgacactcg 60
tatcgtctca atctctgtca aggataaaca gccagaggaa gccagtcgta tcgctaattc 120
tctacgagaa gttgctgcag aaaagatcgt cgctgtaacg cgagtatctg atgtaacgac 180
actgaagaa gcgcgaccag ctacgactcc ctcttctcca aatgttcgac gcaattcctt 240
gtttggtttt cttggaggag cagtcgtaac agtaattgct gttcttttga ttgagttgct 300
cgacaccogt gtgaaacgtc ctgaagatat tgaagatgta ctgaaaattc cacttttagg 360
gctcgttcca gatthtgaca 380

<210> 587
<211> 290
<212> DNA
<213> Streptococcus pneumoniae

<400> 587
atcaacgact tccaccaata tcgcttgggc ttttgcgcgt gcaggttaca aaacgttgct 60

gattgatgga gatattcgca attctgttat gttagggtgc tttaaagcaa gggataagat 120
tacaggcctg acagaatttt tatcaggaac tacagaccta tcacaagggc tttgtgatac 180
caatatcgaa aatctctttg taattcaggc tggctctgtg tcaccgaatc cgacagctct 240
tcttcaaagt aagaatttca gtacaatgct tgaaaccttg cgtaaataatt 290

<210> 588
<211> 507
<212> DNA
<213> Streptococcus pneumoniae

<400> 588
agattacact ttacagcta tctccctcag ctacttaacc agtattattg ttgccttttag 60
gcaggaggga cttagtcaat ttatcttgat actaacagat gatagtttca atggttcggt 120
actagaaatg catgaagttg cacctattac agctctcttt attctgtact atttgtacaa 180
atatattata aaagaaaata gtttttcttc agtattttat aatatcttaa tagctctcat 240
tattcttttt ttaagcctta aacgaatcgt tcttttgagt gtattaatta tcataccagt 300
atttttggta atttattggt atgataaaaa agtaagtaaa ctagggaaag aacgaaaaat 360
tttaagttta ttaaataatct tttccttaat atttataaca ggaatattcc tttatgttta 420
tagtgtaaaa tctgatttta tatatacatt tattcaagaa cataatatta attcgatggc 480
tagaacagat ttatggaagg gaggttga 507

<210> 589
<211> 558
<212> DNA
<213> Streptococcus pneumoniae

<400> 589
tctggactct cgataattgg aataatggtt ttcttatatc taattatggt ccgtctatat 60
ttatatgggt ttgctttcta attatttttc aaattactgg ttttatttta caaaaagtta 120
gtatatatga tttttctgta tggatatctga ttttatctta tttttttatg tttggattaa 180
ttttcaatga gtatatgggg tttcaaacaa ctctgctgtg gagccctagt aacttctata 240
ataatgaaga attatttcat tcatatattt ttataatttg gattttggtt tgttattctg 300
taggctattt atttttttat agtgatggaa aggtacatta tcattcagaa gtacaaaatt 360
atcaggaaaa tgaagagaaa attttgtaca atgcgggtag gattttaaca ggagtgggct 420
ttatttctag ggtaataact gattctaaaa cagtactagc agttagagcg gcgaatagct 480

attcagcata ttcagaggca gctagttcag gaataataga tgatttagga gtacttatgc 540
ttcctggtgt gttctcct 558

<210> 590
<211> 516
<212> DNA
<213> Streptococcus pneumoniae

<400> 590
acatttgta tagtttcctt gttgacaaaa ttgtcgtaca ggcctaaagt ggaggggaatt 60
tcgcatgaag aattgaaaga aataaatcct tcaaagataa tctatgtcat tcttctgact 120
ctaaatcttg ttatgttatt tctttatata cgtgaaatc agaaagtagt attgttttca 180
ggtagaagtt tttctaatat tacagatttg ataagtaact ataggtaacct atcttattat 240
tcaaatgaag tagaaaatcg tgtaagtggg atgattaatc aactatctaa aattattcca 300
gcgactacac ttatttcttt atatatattt atgaataatt attttataac taaacaaata 360
aagaaaaatt tcatttattt gattccaata gctatattct ttgtctatgc aatcattagt 420
ggtagtagat tgccccttat aaggtaggtt gttggagctc tgttgatatt gtatatatac 480
tctgtgtacg ggagtcctaa atctcaactt accaaa 516

<210> 591
<211> 383
<212> DNA
<213> Streptococcus pneumoniae

<400> 591
ttttaaccca ccaagttgac tttagcttga tgcgagagat tggttaagggt tttgcggaaa 60
aatttgctgc tactggcatt accaaggctg taaccattga agcgtcgggt attgccccag 120
ccgtttttac agctgaagcc ttaaacgttc ccatgatttt cgccaaaaaa gctaagaaca 180
tcaccatgaa cgaagacatc ttaactgctc aagtctactc ctttaccaag caggtgacca 240
gcaccgtttc tatcgttggg aaattcctct caccagagga caaggttttg attatcgacg 300
atttccttgc taatggccaa gctgctaaag gcttgattca aatcatcgaa caggccggtg 360
ccacagtcca agctatcggg atc 383

<210> 592
<211> 723
<212> DNA
<213> Streptococcus pneumoniae

<400> 592
gtggatgctc aagaaactgc gggagttcac tataaatatg tggcagattc agagctatca 60
tcagaagaaa agaagcagct tgtctatgat attccgacat acgtggagaa tgatgatgaa 120
acttattatc ttgtttataa gttaaattct caaaatcaac tggcgggaatt accaaatact 180
ggaagcaaga atgagaggca agccctagtt gctggtgcta gcttagctgc tctgggaatt 240
ttaatttttg ctgtttccaa gaaaaagggt aagaataaaa cggattattaca tttagtattg 300
gttgcgggaa taggaaatgg tgtcttagtt tcagtccatg ctttagaaaa tcactttttg 360
ctaaattaca atacggacta tgaattgacc tctggagaaa aattacctct tcctaaagag 420
atctcaggtt acacttatat tggatatatc aaagagggaa aaacgacttc tgattttgaa 480
gtaagtaatc aagaaaaatc agcagccact cctacaaaac aacaaaagggt ggattataat 540
gttacaccaa attttgtaga ccatccatca acagtacaag ctattcagga acaaacacct 600
gtttcttcaa ctaagccgac agaagttcaa gtagttgaaa aacctttctc tactgaatta 660
atcaatccaa gaaaagaaga gaaacaatct tcagattctc aagaacaatt agccgaacat 720
aag 723

<210> 593
<211> 465
<212> DNA
<213> Streptococcus pneumoniae

<400> 593
attatcactg gcggaagac ccataattag gttttttctc gcacattggt gggaacggtt 60
gcatcatgca ggtaggacct gttgataatg gtgcctggga cgttgggggc ggttggaatg 120
ctgagaccaa tgcagcgggt gaactgattg aaagccattc aactaaagaa gagttcatga 180
cggactaccg cttttatata gaactcttac gcaatctagc agatgaagca ggtttgccga 240
aaacgcttga tacagggagt ttagctggaa ttaaaacgca cgagtattgc acgaataacc 300
aaccaaacaa ccactcagac catgtggatc cataccctta cttggcaaaa tggggcatta 360
gccgtgagca gtttaagcat gatattgaga acggcttgac gattgaaaca ggctggcaga 420
agaatgacac tggctactgg tacgtacatt cagacggtc ttatc 465

<210> 594
<211> 452
<212> DNA
<213> Streptococcus pneumoniae

<400> 594
aatggaatga acggaagtga agctgctggt catgaagtgc cagaatacac aggcccatta 60
gggacatccg gcgaagagcc agctccaaca gtcgagaagc cagaatacac aggcccacta 120
gggacatccg gcgaagagcc agcccccaga gtcgagaagc cagaatacac aggcccacta 180
gggacagctg gtgaagaagc agctccaaca gtcgagaagc cagaatttac agggggagtt 240
aatggtacag agccagctgt tcatgaaatc gcagagtata agggatctga ttcgcttgta 300
actcttacta caaaagaaga ttatacttac aaagctcctc ttgctcagca ggcacttcct 360
gaaacaggaa acaaggagag tgacctccta gcttcactag gactaacagc tttcttcctt 420
ggtctgttta cgctagggaa aaagagagaa ca 452

<210> 595
<211> 526
<212> DNA
<213> Streptococcus pneumoniae

<400> 595
ggtcaactgt ccatatctcc tatttttcaa ggaggttcat atcaactgaa caataagagt 60
atagatatca gctctttggt attagataaa ttgtctggag agagtcagac agtagtaatg 120
aaattlaaag cagataaacc aaactctctt caagctttgt ttggcctatc taatagtaaa 180
gcaggcttta aaaataatta cttttcaatt ttcagagag attctgggtga gatagggtga 240
gaaataagag acgccaaga gggaataaat tatttatttt ctagaccagc ttcattatgg 300
ggaaagcata aaggacaggc agttgaaaat aactagtagt ttgtatctga ttctaaagat 360
aaaacataca caatgtatgt taatggaata gaagtgttct ctgaaacagt tgatacat 420
ttgccaattt caaatataaa tggtagatag aaggcaacac taggagctgt taatcgtgaa 480
ggtaaggaac attacctcgc aaaaggaagt attggtgaaa tcagtc 526

<210> 596
<211> 506
<212> DNA
<213> Streptococcus pneumoniae

<400> 596
agtcgcacta gccacatatt tcttcggttt gctagggacc agtacagtat ttgcagatga 60
ttctgaagga tggcagtttg tccaagaaaa tggtagaacc tactacaaaa agggggctct 120
aaaagaaacc tactggagag tgatagatgg gaagtactat tattttgatc ctttatccgg 180
agagatgggt gtcggctggc aatatatacc tgctccacac aaggggggta cgatcgggtc 240

ctctccaaga atagagattg ctcttagacc agattgggtt tattttggtc aagatgggtg 300
cttacaagaa tttgttggca agcaagtttt agaagcaaaa actgctacga ataccaacaa 360
acatcatggg gaagaatatg atagccaagc agagaaacga gtctattatt ttgaagatca 420
gcgtagttat catactttaa aaactgggtg gatttatgaa gagggttatt ggtattattt 480
acagaaggat ggtggctttg attctc 506

<210> 597
<211> 518
<212> DNA
<213> Streptococcus pneumoniae

<400> 597
atttcgagtg ttgcttatgg gcgccaagtc tatctcaagt tggaaaccac gagtaagagt 60
gatgaagtag aggctgcttt tgaagctttg ataaaaggag tcaaggtagc tcctcagaca 120
gagtggaagc agatttttga caatacagaa gtgaaggcgg ttatttttagg gggcgaccca 180
agttcgggtg cccgagttgt aacaggcaag gtggatatgg tagaggactt gattcaagaa 240
ggcagtcgct ttacagcaga tcatccaggc ttgccgattt cctatacaac ttctttttta 300
cgtgacaatg tagttgcgac ctttcaaaac agtacagact atgttgagac taaggttaca 360
gcttacagaa acggagattt actgctggat catagtgggtg cctatgttgc ccaatattat 420
attacttggg atgaattatc ctatgatcat caaggaagg aagtcttgac tcctaaggct 480
tgggacagaa atgggcagga tttgacggct cactttac 518

<210> 598
<211> 534
<212> DNA
<213> Streptococcus pneumoniae

<400> 598
gggtaactat gcgacttctg cttcaagttc ttcatgggat ttagtagcaa ataactatct 60
gaaaatgacc gacactggaa atgtaacacg aactgcagca catgaagatg cgatagcggc 120
cgcttctgct aaaaatcaaa cagttgagtt tgataaagtt aacatagggtg gagaaagttt 180
taaatacaga aatatagggg cttttttcga taagagtaaa atcacaacaa atgaagatgg 240
aacaaaagct cctagtaa ataaaattgt atatataggc aaggggcaag accaagattt 300
gataggtttg gatcttaggg gcaaaattgc agtaatggat agaatttata caaaggattt 360
aaaaaatgct tttaaaaaag ctatggataa ggggtgcacgc gccattatgg ttgtaaatac 420

tgtaaattac tacaatagag ataattggac agagcttcca gctatgggat atgaagcgga 480
tgaagggtact aaaagtcaag tgttttcaat ttcaggagat gatggtgtaa agct 534

<210> 599
<211> 604
<212> DNA
<213> Streptococcus pneumoniae

<400> 599
gatcaacaag ctgaagaaga ctatgctcgt agatcagaag aagaatataa tcgcttgact 60
caacagcaac cgccaaaagc tgaaaaacca gctcctgcac caaaaacagg ctggaaacaa 120
gaaaacggta tgtggtactt ctacaatact gatggttcaa tggcgacagg atggctccaa 180
aacaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 240
tacaatgggt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 300
gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 360
tacaacgggt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 420
gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 480
tacaacgggt catggtacta cctcaacgct aacgggtgcta tggctacagg ttgggctaaa 540
gtcaacgggt catggtacta cctcaacgct aatggtgcta tggcaacagg ttgggtgaaa 600
gatg 604

<210> 600
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 600
gtgtcagcac aaattacgat taaccataaa aaagcgcgct atgttcggat tgagctagaa 60
ggctataatg ccctcagtct tgcagaagtt gaagttttct gctttatagc tacgaatgct 120
gaaacggcga cacaagtttc taagccagtt caaccaatca gtcagactcc tgtgaaggat 180
aaaacattga caattcaaca cagtggagct tacattgccc gctactccat aacttgggaa 240
gaagttccag tagataaaga tggaaaccaa gttgttcgta gtcattcttg ggaaggaagc 300
ggtcgcaacc agactgcagg ttttgcctc aacctcccaa tcaaagaaaa tatgagaaat 360
ctgcgagtta agattgagaa aaagacgggc ctactatgga atagatggca aacaatctat 420
gaaaacagac caatttttagc tcaacccac cgtaaaatta cccattgggg tacgacattg 480

aattccaagg tgagtgcga 500

<210> 601
 <211> 419
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 601
 tgttcggatt gagctagaag gctataatgc cctcagtcct gcagaagttg aagttttctg 60
 ctttatagct acgaatgctg aaacggcgac acaagtttct aagccagttc aaccaatcag 120
 tcagactcct gtgaaggata aaacattgac aattcaacac agtggagctt acattgcccg 180
 ctactccata acttggaag aagttccagt agataaagat ggaaaccaag ttgttcgtag 240
 tcattcttgg gaaggaagcg gtcgcaacca gactgcaggt tttgtcctca acctccaat 300
 caaagaaaat atgagaaatc tgcgagttaa gattgagaaa aagacgggcc tactatggaa 360
 tagatggcaa acaatctatg aaaacagacc aatttttagct caacccacc gtaaaatta 419

<210> 602
 <211> 401
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 602
 atctgtagaa ggtcttggtt tcgcaattcc tgcaaagtat gctatcaata ttattgaaca 60
 gttagaaaaa aacggaaaag tgacgcgtcc agctttggga atccagatgg ttaatttata 120
 taatgtgagt acaagcgaca tcagaagact caatattcca agtaatgtta catctggtgt 180
 aattgttcgt tcggtacaaa gtaatatgcc tgccaatggt caccttgaaa aatacgatgt 240
 aattacaaaa gtagatgaca aagagattgc ttcatacaaca gacttacaaa gtgctcttta 300
 caaccattct atcggagaca ccattaagat aacctactat cgtaacggga aagaagaaac 360
 tacctctatc aaacttaaca agagttcagg tgatttagaa t 401

<210> 603
 <211> 690
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 603
 atttgtgagg atcttggtga gagaggtcat gaagttactg ttttgacagg aattcctaata 60
 tatcctgaag gtaaaacata tgcggattat cggaataaca aaaatagacg agagactata 120

gaaggagtta ctgtttttcg ttcctataca attccaaggg gaaaaagtac tttacatagg 180
 atattaaatt attttagttt tgctatcagt tcctcgatag gggttctact gggacagtat 240
 aaagcaaaag atggatcaga atttgattgt atttttgtaa atcaatcgtc tccagttatg 300
 atggcatggg ctgctatggc ttataaaaat aaatataaga aacctatggt tctgtattgt 360
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 aagttgttta aatttatatc gaaaaaagtt tatcgagcta gtgattatat atttgttact 480
 agtccatcat ttaagaatta ttttgtgaac caatttgaca taacagaaca aaagattact 540
 tatttgccac aatatgcaga agatcttttt atccctgatg aatctagagt taataaagaa 600
 agtggtgacc taacttttgc tggtaatatt ggcaaagcac aaaatttgga aactattttg 660
 aaagctgcca gtttgataga gaagaatacc 690

<210> 604
 <211> 588
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 604
 caacttctga ttatgccttt gtggatcctg ttgggagtag tgtctatttt ttctagaatt 60
 gacatggaac gatcattcct atttttttta ttaacaatag gttgtttaat tagcactatt 120
 gctttgttag atatagttac gggagtatct tatgtcttta atggtttgte tcagcaactc 180
 tatttggtcg tgggaattct agtttttaggc tactggaatg ctgatgtgat tgttcattat 240
 tggaaaatca tcacatgac ttttttggga gcatgtttgc tgatttcagt ggatatttat 300
 ttctactact ttcaaggaca tactttttca aatattgatt atgtttatcg agctaagaat 360
 tcagcggcat ctatcttttt atcggcagtt attctcaact tgtctctata taatcgcaag 420
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 <213> Streptococcus pneumoniae

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| ttttgatatg acttggtttt tatcaggatt ggaacgtttt cgtgaaattg ctgttcgaaa | 420 |
| tatcattgta aatgtcttat cagccctcat gatttttttc tttgtgcata cggaggctga | 480 |
| tttggctatc tataccttaa taaaggtagg gacgattttt atcagtcaga ttgttatttt | 540 |
| tttaccagtt gttcggatgc aacggtttta tcttgacgga gctgaacata ttcgacgtac | 600 |
| ctatcgaggc ttgcttttgt tgtttatccc tgttttgga gacacccttt ttcaaactat | 660 |
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| tatagaagct gtcagcaaat tagccgcacc agttaaaaac gatacttcaa atattactga | 420 |
| tttगतagaa catataaaat cagaaaaagg aatctctatt acaccacaaa aaacagattc | 480 |
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